The Builder.

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ILLUSTRATIONS.

Nether Swell Manor, Gloucestershire.....Mr. E. Guy Dawber, A.R.I.B.A., Architect
Sanatorium for Consumptives, Frimley.....Mr. E. T. Hall, F.R.I.B.A., Architect.
Design for Drawing-room Decoration.....By Mr. T. Wallace Hay.

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Rock-hewn Dwellings.

THE primitive manners and customs of mankind have a way of surviving throughout the ages, in spite of the modifying influences of luxurious and scientific development. Sometimes a mode of living may be observed in vogue in these latter days of the world's history which carries the imagination back to a quite geologic age, when our rude forefathers dwelt in the caves where their fossilised remains are chiefly to be found.

Ever since the most remote ages, countless thousands of years ago, the caves in the warmer regions of the earth have been used as dwellings, and in some cases by people belonging to civilised races. Such a mode of being housed would naturally suggest itself to the poorer classes of the community, and so the system has found favour in every age. But, in addition to the numbers of people who have sought such a home from reasons of economy or concealment, there have been others affected with apparently superstitious or religious motives. In making a study of these developments it will be sufficient to confine attention to the shores of the Mediterranean and their immediate vicinity, where caverns have been used, perhaps, in more various ways than elsewhere in the world. In the most primitive times of Greek or Etruscan history, caves were used for religious purposes. An oracle was associated with innumerable caverns in Greece and Italy as a particularly fitting combination. The idea of the primitive cave-temple even survives in the majority of more important Greek temples in the form of the Adytum or Megaron constructed beneath the floor of the building. This cave of mystery seems to be copied over again in the crypt of the earlier Christian basilicas, and although its use and significance may have been changed in later ages, it is clearly a singular instance of a surviving idea from extreme antiquity.

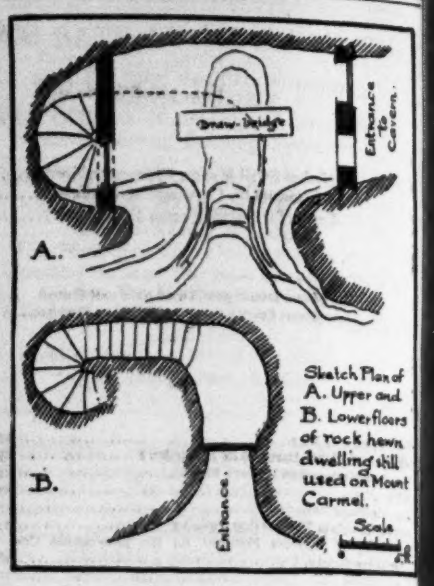
In regard to rock dwellings in America, the Aztecs are amongst the most ancient of such dwellers in the New Continent; but in all parts of Central America are to be found traces of this primitive mode of taking advantage of natural capabilities amongst the rocks and caverns. In Arizona, Colorado, and New Mexico whole villages have been formed in this manner, the means of communication between the houses being sufficiently ingenious, but often extremely difficult of access. The inhabitants of such houses belonged probably to the Puebla race of Indians in modern times, and as late as the sixteenth century they were still to be found in Central America occupying the "homes" of untold past-away generations and centuries. In Northern Europe few, if any, such dwellings existed within historical times in Germany or the British Isles. Here and there a hermit's cell may have been tenanted at times; but the rigorous climate, and the general unsuitableness of such a life under the circumstances, prevented any regular development such as may be observed in the south. Abyssinia from Berenica towards the south was known to the ancients as "Troglodytica."

The land where the cave-dwellers and cave-worshippers have always been found in the greatest numbers, and where they still survive at the present day in innumerable communities, is Palestine. Here this mode of life is closely associated, apparently, with certain religious customs and traditions—in other countries like Spain or Italy the cave villages are made use of for more sordid reasons. For instance, the very curious rock-cut village of the Barraneo at Grenada in Spain, inhabited at the present day by innumerable gypsy families under the rule of their "king," is chosen by such people for merely indolent reasons. Gypsies in other parts of the world have similar lazy characteristics, and a degraded part of the population in Cyprus exists under this name and in this manner. In such cases the settlements have usually been made in abandoned quarries. In Palestine these Troglodytes have been almost exclusively Christians ever since the introduction of the religion, both as dwellers and worshippers in natural or rock-cut caverns. And this fact is of particular interest in connexion with the early history of Christianity all over the Roman Empire.

In Italy and Greece the hermits' cells in community, or as solitaries, were invariably caves, sometimes left in their natural condition, to judge by the numerous examples remaining amongst the Apennines.* In the Levant, on the contrary, these places are almost always more or less artificial. In the valley of the Jordan, and its ramifications on either side, the Orthodox and other Christians still make their homes amongst the rocks in almost incalculable numbers. At the present day it is comparatively easy to inspect this curious method of life, followed by such numbers of men (and even women are not unknown) who, renouncing the comforts of civilisation, prefer to live in the most primitive style possible. One of the easiest visited of such communities exists in the Wady el Kelt, a long narrow valley leading down from Jerusalem to the Dead Sea and Jericho. This valley, being the traditional scene of Elisha's retirement, and of the story of the miraculous feeding by ravens, has always possessed particular attractions for the imitators of the prophet; though of late years the legend of the ravens has been somewhat discounted by the discovery that the Hebrew word "Horim" may have meant the name of a Semetic tribe of the locality, as well as the birds in question. Here at the bottom of the valley, where a tiny rivulet affords a constant supply of drinking water, the successors of untold generations of hermits still live as in the days of Elisha, and on the same meagre fare—a dish of pulse and a few fruits—the produce of their scanty gardens their only means of sustenance. A certain amount of additional food may, however, be supplied by the modern Arab representatives of the "Horim," who in this district are Christians of the Orthodox Church.

In Syria rock-hewn dwellings (often amplifications of natural caverns) are a particular characteristic of the country. The comparatively little-known Hauran is full of ramifying underground excavations, partly the result of digging for lime in the soft limestone of the country, but enlarged and augmented for residential purposes. The German Palestine Exploration Society has

* In Central Italy some rock-hewn villages are still in use. One such village may be observed from the railway in passing between Parma and Reggio Emilia. In Cyprus, towards the extremity of the Carpus range of mountains, where they form a finger-like promontory pointing into the Gulf of Alexandretta, an immense underground town or convent appears to have been excavated in a particularly inaccessible range of cliffs. This curious place is described in Sir Samuel Baker's book on the island. Very few persons seem ever to have visited it, and its date is problematical.



done much towards investigating this district, in spite of the natural opposition evinced by the natives, who still make very considerable use of these excavations as places of concealment from Turkish tax-gatherers, if not, as in the old days, places of refuge from impending massacres. The interesting town of Ed Deràah in the Hauran has been partly explored by Professor Schumacher, a German engineer of Maifa, and described in the papers of the English Palestine Exploration Fund,* where will be found an interesting account of his adventures in an underground labyrinth of ancient dwellings leading one out of another. The Professor employed the ancient device for finding his way about in these somewhat dangerous places by tying one end of a ball of string at the entrance and exploring the interior as far as the string allowed. The chambers of this ancient town are in some cases lined with masonry, and also the long airholes, often 70 ft. in height, which lead up to the earth's surface, are constructed with masonry. To judge, however, from Mr. Schumacher's plans and sketches there is very little to be found in these underground recesses of an architectural character. The columns used as supports to ceilings, and other fragments of wrought stone, have evidently been furnished by Roman ruins in the vicinity. Above this subterranean town of Ed Deràah are the ruins of an ancient village, probably of Byzantine times, which may have been built of stone quarried in the underground town.

The Shefalah, or district of Southern Palestine between Hebron and the sea-shore, is almost as full of these excavations as the Hauran, but the lower portion of the Jordan Valley and the neighbourhood of the Dead Sea are perhaps as remarkable for the prodigious numbers of the rock-cut tombs, convents, and hermitages crowded together in this part of the world as for the singularity of the scenery and the historical associations. The immense number of the rock dwellings and tombs still in use give an importance to this mode of life which can hardly be realised in any other country at the present day. Quarantena, or the "Mount of Temptation," a hill to the north-west of Jericho, which was early identified with the story of Christ's temptation in the Wilderness of Judea, is honeycombed with convents and hermitages, many of them being of extreme antiquity. The most important of these convents constituted a small village. The winding road which mounts the side of the sacred mountain passes through rock cuttings which remind one almost of a Swiss *axenstrasse*, and through large caverns which have been built up with sub-dividing walls, forming houses of one or more stories. The view from the windows of such houses embraces the Jordan Valley and the Dead Sea plain. This particular convent may be easily distinguished from so far away as Jericho by the enormous gilded cross recently erected in front of a cavern, against the darkness of which it shines resplendent in burnished metal.

Farther to the south in this district are the famous caverns so graphically described in the "Talisman," although Sir Walter Scott's account of their use by Queen Berengaria is probably a little more romantic than historic. At the present day this centre of ancient hermit life seems abandoned, and is even difficult to visit on account of the predatory character of the *felaheen* of the district. In the upper valley of the Kedron, not far from Jerusalem, a considerable convent of Greek "caloyers" has grown up in a series of ancient sepulchres, probably Jewish, and in addition to the underground chambers occupied by the monks, a number of superterranean buildings have made their appearance during the past few years.

The Greek Monasteries of Meteora in Thessaly may, perhaps, be classed with rock-hewn dwellings. They, at least, owe their existence to a desire to take advantage of the most inaccessible rocks on the part of the Christians of the fourteenth century—whether for reasons of a superstitious nature, or merely as refuges from the impending Turkish persecutions. They contain rock-cut chambers and chapels decorated with the usual frescoes of the Orthodox Church. These monasteries are reached by dizzy ladders and by the usual windlass arrangement; the highest of them is over 1,800 ft. above the plain. The Greek Government has of late years been converting this most interesting national monument to the use of a convict establishment! It is an unfortunate fate, but the original need for these religious refuges no longer exists, and the modern monks of the Orthodox Church have long since abandoned them for more reasonable habitations under ordinary conditions. The Meteora (*i.e.*, in the air anchorets may have some relationship to St. Simon Stylites.

The subject of our sketches is a picturesque example of the kind of rock-cut dwelling still used by the Greek caloyers in Syria and Palestine. It is, of course, very difficult to define the age of such a habitation—it may be of comparatively modern construction, or it may, on the contrary, date back to the most primæval times. It has, at least, been fitted with quite modern doors for use at the present day. It is situated in a very narrow and picturesque valley of the Carmel Hills, where a garden of orange and walnut trees makes a dark seclusion round a well spring, and affords a glimpse into the ideal existence of the hermit life under most favourable circumstances. At the time our sketches were made the large cavern, an entrance to which is shown on the upper of the two plans, was inaccessible. The curious and ingenious device of using the natural cleft in the rock, with a rough drawbridge spanning it, as a means of security, reminds one of the famous story in Josephus of the cavern at Masada defended by the Jews against the Romans, who attacked it by being lowered over the cliff in boxes prepared for the purpose.

* "Across the Jordan," published by P. E. F. Papers on rock-cut villages, &c.

THE LAW OF LIGHT—DAMAGES OR INJUNCTION?

In discussing in a recent issue the Ancient Lights Bill brought into Parliament this Session under the auspices of the Royal Institute of British Architects and the Surveyors' Institution, we referred to the need for legislation on the lines of Lord Cairns' Act—that is to say, to the desirability of increasing the jurisdiction of the Courts to award damages rather than to grant injunctions. The point is one of so much practical importance, and the necessity for an alteration of the law has been so clearly exemplified in the recent case of Cowper *v.* Laidler (Law Reports, August, 1903) that it may be desirable to allude to this point in somewhat greater detail.

Where a right to light exists it may either be actually interfered with or there may be danger of interference by proposed buildings. This distinction is important in regard to the subject under notice, because, while under

Lord Cairns' Act, preserved by the fifth section of the Statute Law Amendment Act, 1883, there is clearly power in the Court to award damages in place of an injunction, it is doubtful if there is any such jurisdiction to give damages instead of a prohibitory injunction—that is, when an injury to a right to light is threatened but has not occurred. In 1894, in the case of Martin *v.* Price, the Court of Appeal said that the question was one of very great importance, and not free from difficulty; but they did not decide it, holding that under the circumstances of the case before them, namely, an actual diminution of light by a building in course of construction, and a further diminution by the proposed but not completed portion, the owners of the dominant tenement were entitled to an injunction. In other words, they exercised their discretion by granting an injunction, a proceeding which prevented the need for deciding if they had power to give damages. In the case of Cowper *v.* Laidler, decided by Mr. Justice Buckley a few weeks ago and now officially reported, there is a careful review of the law on this subject, and the Judge clearly came to the conclusion that the Court would only award damages in place of an injunction under very exceptional circumstances. Indeed, his judgment comes prettly nearly to this, that unless the owner of the easement agrees that damages shall be paid instead of an injunction being granted, the Court ought not to oblige him to receive money for the violation of the right. It was, he says, stated in a case decided in 1895 that since Lord Cairns' Act only fourteen cases were to be found in which damages were awarded against the will of the plaintiff, and that these were cases where a mandatory injunction would have been granted. If these figures are approximately correct, they show that Lord Cairns' Act has been practically a dead letter, for it is nearly half a century since it became law. They show, also, that a distinct change is required, and that the court should award damages, unless the owner of the dominant tenement cannot be properly compensated by them. It must not, of course, be supposed that damages are not in fact frequently paid; but the power of obtaining an injunction enables the owner of the dominant tenement to obtain from the owner of the servient tenement exorbitant and unreasonable sums. The case recently tried before Mr. Justice Buckley shows how fallacious, in our opinion, is the legal basis on which injunctions are granted.

The owners of the dominant tenement claimed an injunction in respect of the light to a small cottage in Newcastle-on-Tyne, in a part of the town where new and important buildings were in course of erection. "The defendant," said the Judge, "says that the plaintiff is extorting money by asking for an injunction, and thus compelling the defendant either to buy at an unreasonable price or to keep his buildings down." Now let us observe the answer. "It is not extortion to ask a price which a property for exceptional reasons commands." But there is an obvious fallacy in this remark. The cottage in question—it will serve very well as an example—did not command an exceptional price by reason of its intrinsic value, but partly because there existed a right to light in respect of which an injunction could be obtained, and so a high price has to be paid for a building in itself of little value.

If the owner of the servient tenement could have so erected his building as not to interfere with the light of the cottage, it would have doubtless turned out that a small price only could have been obtained for this insignificant building; for the sum paid in respect of the right to light must not be confounded with the price for the site. Throughout the latter portion of Mr. Justice Buckley's judgment there is in fact a confusion between the value of a dominant tenement in respect of site, and the existence of a right to light for the use of a tenement, and the fancy or unreal value caused by the power of preventing the erection of a building on the servient tenement. In other words, the owner of the latter does not give the dominant owner a sum to represent a valuable right in fact, but a sum to prevent an action at law or the stoppage of his own building operations. If land is taken by a railway or other company under compulsory powers, the claimant is only entitled to its real value plus 10 per cent. for compulsory purchase. If the owner of the land could prevent the company from carrying on its operations by reason of the proximity of the undertaking, unless he were bought out, then he could put a fancy price on his land. This would be analogous to the present state of affairs in regard to the law of light. The owner of a building of the most trumpery kind, occupying a site of infinitesimal size, but having a right to light through a single small aperture, can under present conditions obtain from an adjoining owner many times the real value of his property simply by the threat that he will stop the erection of important buildings if the sum which he demands is not paid.

If the law were changed so that the Court should award reasonable damages, then exorbitant and unreasonable sums would not be obtained. Mr. Justice Buckley appears to think that there is something unjust in obliging an owner of a dominant tenement to be recompensed by money. "To refuse," he says, "to aid the legal right by injunction and to give damages instead is, in fact, to compel the plaintiff to part with his easement for money." As a matter of fact, this is what owners of dominant tenements are doing every day, but they are obtaining unreasonable sums on account of the state of the law. If an owner of a house is properly compensated, he is not suffering an injustice, and if the law were that only where damages cannot reasonably compensate the owner of a dominant tenement he should obtain an injunction, then his rights would be completely safeguarded. We recommend the perusal of the case of Cowper *v.* Laidler to all interested in this subject, and if the Institute of Architects would bring in a modest Bill next Session to deal with the point of injunction and damages, they would, if it became law, have done much to place the matter in a sounder and more reasonable state.

THE PARIS METROPOLITAN RAILWAY FIRE.

No previous railway disaster approaches the tragedy of Tuesday last with regard to the loss of life and the horror of the surrounding circumstances. Looking at the bare facts as they are reported by those who were present, it appears that a train coming from the Porte Dauphine stopped in the tunnel beyond the Barbes Station, owing to some fault in the electric motor, and the passengers were obliged to descend and walk to the next station. Fire then broke out in the trolley-car, and a succeeding train, full of passengers, was used to push the disabled train along the line. On arriving at Couronnes Station flames were already visible, but the driver, apparently acting upon his own responsibility, made no stop and entered the next tunnel at full speed with the object of removing the burning train to the terminus. Unfortunately for the success of this attempt, the two trains had not proceeded far when an explosion was heard, and the carriages of the empty train burst into flames, and, the electric conductors parting, the lights were extinguished. The passengers in train No. 2 fled hastily in both directions down the dark tunnel. By this time a third train had reached the Couronnes station, and was unable to proceed owing to the absence of current. After some trouble passengers in this train were persuaded that real danger existed, and most of them escaped into the open air. Many, however, found their way in the darkness to one end of the platform at which there was no means of egress, and there they were suffocated. Some others, being unable to force their way up the staircase, walked back to Belleville station, and so escaped. At Menilmontant station, beyond the burning trains, thick smoke commenced to pour out from the tunnel, and several persons who were waiting for trains, being thereby prevented from reaching the staircase, ran along the line towards Père Lachaise station. Subsequent examination showed that, of the sixteen coaches constituting the two trains in the tunnel, absolutely nothing was left but the iron wheels and frames. Not an inch of the woodwork remained, and even the glass of the windows was melted, some of it lying in lumps upon the permanent way.

That the loss of life was increased by the absence of intelligent supervision is quite clear from the foregoing history of the calamity. When the first train was discovered to be on fire, it was quite right for the passengers to be turned out, but all traffic should have been suspended until the officials were certain that no danger existed. Instead of this, another train was allowed to proceed along the same line, and the driver adopted a course which was directly calculated to fan the flames and to imperil the lives of his own passengers. But, further, it is clear that no materials of a combustible nature ought to be used in the construction of carriage bodies employed on underground lines. The floors, sides, ends, roofs, doors, and window-frames should be of material that will not afford a foothold for fire or furnish fuel to flames. Danger comes in the first instance from the motors, and it should be perfectly easy to isolate these by metal and fireproof material, so that ignition of the trolley-car and adjoining coaches should be absolutely out of the question. Any wood or textile fabrics used for interior fittings should be treated by some approved process, so that they may be able to resist flame for a sufficient period of time. If precautions such as these had been taken on the Paris Metropolitan Railway, this disaster, which is now regretted by the world at large, could never have occurred. With carriages built of combustible materials it would be highly dangerous, if not impossible, to send a rescue train on the other line of metals to

remove passengers from the scene of danger, and if carriages were built on fire-resisting principles, no such device would ever be necessary. Considering the liability of electric lamps to become extinguished by disorganisation of the conductors, facilities for the use of gas or oil light ought always to be provided for cases of emergency, and, in view of the fact that many passengers lost their lives this week owing to their inability to make their way from the platforms, it seems clear that further means of egress should be provided in all underground railway stations. One of those who escaped on Tuesday last states that "it was impossible to get out into the street. The stairs of the Couronnes station were encumbered by people coming down to take the train. They did not want to make way for us. . . . The two streams of passengers were thus at a standstill at the foot of the stairs." This passenger then ran back to Belleville station, where he found that the people thronging the staircase did not wish to go up. He continues, "However, we had to get out. We were up to our necks in smoke. I sprang forward with my fists extended, and managed to get up the staircase."

This account illustrates the necessity for more staircases and for the better management of those that already exist. Railway companies delight in erecting barriers and gates, and very frequently opposing streams of passengers are compelled to fight their way to and from the platforms. This is the case in many of our London railway stations, and as no disaster has yet been recorded to arouse general condemnation, such arrangements will probably continue.

The Paris disaster will no doubt cause some people to think twice before entering the low-level lines in our own metropolis, the means of escape from which are less accessible than those in shallow subways. We observe that the General Manager of the Central London Railway has already made an announcement stating that no similar accident could occur on that system owing to the precautions taken for the prevention and extinction of fire, and to other regulations intended for the safety of the public. We do not gather, however, that the adoption of non-combustible cars is one of the precautions in question. The application of fire-resisting construction to railway carriage building is a development which must be insisted upon, and especially in the case of underground railways.

NOTES.

A National School of Architecture.

In this month's issue of *Architectural Association Notes* Mr. A. N. Prentice puts forward, in a short leading article, a plea for the establishment of a National School of Architecture. He argues that while the Institute, the Royal Academy, and the Architectural Association, have each been contributing in different ways towards architectural education (we may add that the work of the Architectural Association in this field has been by far the most practical and important), why should not the Institute, with the aid of the allied societies, make a strong representation to Government to establish "a National School of Architecture?"—Parliament to give an annual grant for the purpose, and the Government to issue diplomas to those who had successfully passed through the course of training. Mr. Prentice goes on to suggest the formation of a "British School of Architecture" in Rome: in short, assimilating the whole education of the architect in England to that existing in France. "First catch your hare," would be our first comment. It will take a generation of training to get the House of Commons to see that public money ought to be spent on such an object. If it could be done, it would in the main be a great thing for English architecture, though in regard to the proposed school in Rome for the study of monuments of classic art we may remind Mr. Prentice that in France the effect of this special study has been much questioned—it has been said that it leads inevitably to an academical quality in architectural design. The great thing in the French Government system of architectural training is that the Government really cares about it and about the architects who do well in it; that if a French architect has obtained such a distinction as the "Prix de Rome" he is never lost sight of by the State; he is certain to have important work put in his hands at the first opportunity. If we could create in this country a Government willing to spend money liberally on public architecture, and desirous to encourage the men who had distinguished themselves in a national architectural training, by putting important work into their hands, there would be a great difference in the condition of architecture in this country; but, as we said, it would take at least a generation to get such an idea into the heads of English politicians.

Manchester School of Architecture.

This school, as we announced some time since, has been established pursuant to arrangements made between the Owens College, the Manchester Municipal School of Technology, the Municipal School of Art, and the Manchester Society of Architects. A representative advisory committee has been appointed, with Professor S. H. Capper, M.A., A.R.I.B.A., Director of the School. The following courses have been arranged, viz.:—1. History of Architecture. 2. Elements of Architecture. 3. Architectural Drawings and Design. 4. Freehand Drawing and Modelling. Mr. Glazier, A.R.I.B.A., Mr. Corbett, A.R.I.B.A., and other members of the staff of the School of Technology and of the Municipal School of Art will take part in the instruction given in those institutions respectively. The courses are intended (1) for students who intend to take the degree of the Victoria University in the Honours School of Architecture; (2) for students who desire to take a full course in architecture without proceeding to the degree; (3) for students who desire to attend any of the special lecture courses of Professor Capper; (4) for students who desire to attend special courses at the School of Technology or School of Art, including certain of the courses in the School of Architecture. An announcement will be made after Professor Capper's arrival in Manchester in September as to courses for a second and third year, and a further announcement will be made with regard to the classes on Building Materials and Construction, Descriptive Engineering, and Sanitary Engineering. A course of four popular introductory lectures will be given by Professor Capper in the Whitworth Hall, in October and November, at 8 p.m. The subject will be "History in Architecture: The Mediæval Abbey and Monastic Orders and the Mediæval Cathedral." Admission to these lectures will be free. Inquiries may be addressed either to the Principal of the Owens College, or to the Principal of the Municipal School of Technology, Manchester.

Landlord and Tenant.

Since the year 1875 when the Judicature Acts abolished much of the formality in legal procedure, a feeling has grown up that technicalities are entirely abolished in the law. We have from time to time drawn attention to the fact that this is by no means true, and the case of Harman *v.* Ainslie, reported in the current Law Reports, furnishes another example of how technical the wording of leases is. The defendant was the assignee of a lease of certain premises at Southend which contained two classes of covenants; the first positive covenants relating to the payment of the rent and taxes, the second negative covenants against using the premises for certain trades and against sub-letting without leave, and the lease further contained a proviso that "if the lessee shall commit any breach of the covenants hereinbefore contained, and on his part to be performed" there should be a right of re-entry by the lessor. Under this proviso the plaintiff, the purchaser of the reversion, claimed to re-enter on the ground that the defendant was using the premises for trade in breach of the covenant, but the court has held that the proviso for re-entry in the above form only applies to the affirmative and not to the negative covenants. The court pointed out that had the clause been worded slightly differently—for instance, had it referred to any breach of the covenants, omitting the words "on his part to be performed," or even had the words "and observed" been added to the clause as it stood, after the word "performed," it would have sufficed to embrace the negative covenants. A subsidiary point decided also in this case is that a licence given by the original lessor to the original lessee, under the terms of the lease, also operates as a licence to an assignee. Since, therefore, the trade carried on by the defendant came within the description of trades for which his predecessor had obtained a licence under the lease from the lessor, no breach of covenant was, in fact, committed.

London Traffic Commission.

Some practical suggestions have recently been made by the Automobile Club for the consideration of the Royal Commission on London Traffic. The first of these is quite out of the question, although it possesses considerable intrinsic merit. It is a proposal to continue Pall Mall through the Green Park, so as to converge upon Piccadilly at the widened portion near Hyde Park Corner. This would certainly be more effective than any widening of Piccadilly, as it would permit a large proportion of the traffic from Charing Cross to proceed by a most direct route to Hyde Park Corner. However, we cannot afford to bring the road of London traffic into one of the few comparatively quiet places still remaining. Another proposal for which a good deal may be said involves the forma-

tion of a thoroughfare round London, so that traffic from Middlesex to Essex need not pass through the crowded streets of the West End and the City. Attention was also directed to the dangerous junction of Tottenham Court-road, Euston-road, and Hampstead-road, a point where the expenditure of about a quarter of a million is contemplated for widening works. The Club suggested the construction of a tramway station near this junction. This would be very useful, as it would relieve Hampstead-road from the permanent obstruction caused by the tramcars, which at present occupy a sort of informal station in the middle of the street.

The Beginning of a New City.

IN the selection of a site for the new capital of the Commonwealth of Australia, the Commissioners appointed to report upon the question have been fortunate in discovering a place which is conveniently situated between Sydney and Melbourne, and is equidistant from Adelaide and Brisbane. At one time Melbourne hoped to become the Federal capital, a similar aspiration being entertained by Sydney, the capital of the oldest Australian colony. The site selected is within the State of New South Wales, and is at present occupied by a small township, known as Tumut, containing some 1,300 inhabitants. Tumut is situated in a high valley among the mountains around Mount Kosciusko; it is well watered, and the climate is not only cool, but is also free from those extremes which are so much felt in other parts of the continent. In early times Tumut was chiefly known as a gold-digging centre, but most of the inhabitants are now interested in agricultural pursuits. What is termed the town consists of a single street descending from the slope of a hill to the river below. Most of the dwellings are one-storied timber cottages, the better-class buildings being of brick, built in the bungalow style, and in the central part of the street there are a few two-storied houses used as banks, hotels, and stores. The public buildings comprise the post-office, school of arts, two schools, and four churches. This isolated village will presently become one of the chief cities of the world. Its isolation can be removed by the construction of some twenty miles of railway line from the terminus at Gundagai. The latter town is only thirty miles from an important junction, whence the Federal legislator can travel at will to Queensland, Victoria, or South Australia. The Commissioners are to be congratulated on their choice of a site. They have found one that possesses all the required natural advantages, that is convenient of access from all parts of the Commonwealth, and that gives no occasion for political jealousy.

The Working Men's College, Great Ormond-street, and Proposed Removal.

THIRTY years ago a corporation was formed as a company, limited by guarantee, for taking over the property and liabilities of the Working Men's College, which had been established in 1854, in a house, since renumbered 46, in Great Ormond-street, by the joint efforts of Frederick D. Maurice, who was the first principal, Ruskin, Thomas Hughes, J. M. Ludlow, and Charles Kingsley—"to provide instruction for working men at the smallest possible cost in the subjects with which it most concerns English citizens to be acquainted." In the autumn of 1900 a building fund of 8,000*l.* was opened for the enlargement and reconstruction of the premises, after designs prepared by, we understand, Mr. W. D. Caröe, as a memorial of the late "Tom" Hughes, who succeeded Maurice in the principalship. The corporation recently entered into possession of the adjoining house, No. 44, but determined to postpone its adaptation for purposes of the College in view of certain negotiations for sale of their property in the street. Finding that the accommodation afforded by the two houses and their outbuildings at the rear had become inadequate to meet the increasing requirements of modern education and the growth of the institution, they had begun preparations for partially rebuilding and enlarging the existing premises. In the meanwhile negotiations took place between the corporation and the trustees of a fund provided by Mr. W. Waldorf Astor for the benefit of the adjacent Hospital for Sick Children, for the sale of the entire premises at a price of 21,000*l.*, and upon conditions in favour of the corporation. In June-July last they passed and confirmed a special resolution for altering a clause of their memorandum of association so as to enable them to carry on the College in either its present situation or elsewhere, and to dispose of any part of their existing property. The resolution has been duly approved by the Board of Trade, and last week Mr. Justice Swinfen Eady made an order, under the Companies (Memorandum of Association) Act, 1890, in confirmation of the special resolution. In their petition to the Court for the order the corporation represented their desire to ratify the sale for 21,000*l.*, and to acquire a new site for more commodious buildings. We may add that in June of last year the Board of Education made an order to establish a scheme in respect of a sum of 400*l.* a year, payable, in terms of a scheme under the City of London Parochial Charities Act, 1883, to a joint committee of the College and of the now dissolved College for Men and Women in Queen's-square, Bloomsbury. The house, No. 46, in Great Ormond-street, which will thus be displaced, contains a fine main staircase: it has been identified with the residence of Lord Thurlow whence, in the night of March 24, 1784, thieves carried off the Great Seal, having broken in over the wall of the garden that then lay open to the fields beyond. No. 44 has a finely decorated interior; the railings, with the gates in front of the door, and the lamp-holders, are handsome examples of old domestic ironwork now very uncommon in London.

McDonald Chair of Architecture, McGill University, Montreal.

MR. PERCY E. NOBBS has been appointed to the McDonald Chair of Architecture at McGill University, Montreal. A pupil of Mr. Lorimer's at Edinburgh, Mr. Nobbs has given several instances of the fine quality of his architectural designs in the annual competitions of the Royal Institute of British Architects, his drawings in water-colour being specially noticeable. That architecture is beginning to be one of the subjects upon which competent instruction is provided at the universities is a matter of satisfaction to all interested in its welfare; instruction cannot fail to bring about good results if it is based on present-day needs as well as historic instances.

The Late Mr. Phil May.

MR. PHIL MAY, whose death was announced last week, was an artist in black and white of remarkable natural genius, which he might have turned to far more artistic account than he actually did. As a master of pen-line drawing he came nearer to Charles Keene than any one else; but his range of subject was exceedingly limited. Whether he really felt an inability to portray effectively any other type but the *gamin*, or whether he thought that the *gamin* had been neglected in art and offered a new field for the artist—whether, in other words, his limitations were of necessity or of choice—it would be difficult to say. He appears to have entered into the ways and characteristics of the London *gamin* (and *gamine*) as no one else did, and treated them with that mastery of pen-line drawing which knows not only what to indicate, but also (an equally valuable knowledge) where to stop; his sketches remained sketches, and were never weakened by an unnecessary line. To come across one or other of them singly in *Punch* was always a pleasure and an amusement; but a collection of a number of them in a volume (one such was sent to us once) formed a depressing study—that of a talent entirely expended on the illustration of mean, ugly, and vulgar types of human existence. His talent was much appreciated among artists; and on one occasion, when he was invited to accompany the members of the Royal Academy on one of their out-of-town excursions, the menu-cards of the Academicians were successively passed up to Mr. May, at the close of the dinner, to be decorated with an extempore caricature from his pen.

MAGAZINES AND REVIEWS.*

Public Works, of which the first number is before us, seems likely to form a very useful *répertoire* of practical information. The publication, apparently, is to be in the middle of the month, the first number being dated July 15, so that the current number will generally arrive too late for our monthly summary. The July number contains an article on "Public Irrigation Works for South Africa," by Sir W. Willcocks; one on the Uganda Railway, by Mr. H. B. Molesworth, describing the special difficulties encountered in consequence of the nature of the country through which the line has to be made; one on the "Tramways of Glasgow;" one on "American Sewerage Design," in which American practice is compared with English in some particulars. There seems to have been an idea also of leading off with descriptions of certain bodies or institutions connected with public works, as there is an article on Cooper's Hill College, one on the Institution of Civil Engineers, and one on the Office of Works. The latter article, which is anonymous, will surprise many readers by the account of the numerous and varied matters which rest in the hands of the Office of Works, but the writer does not seem the least aware of the objections that exist in the architectural world to the Office of Works; more especially to the system by which the appointment of First Commissioner of Works is made on merely political grounds, without any reference to special acquaintance with architectural work. We happen to have a very capable First Commissioner at present, but it is merely by a kind of fortunate accident; the system of appointment does not ensure it, and we have had a good many very incapable ones who did a great amount of mischief. The writer is mistaken also in saying that the

* Concluded from last week.

designs for the War Office and the Great George-street offices had been severely criticised; they never were so far as we know; what was severely criticised was the action in regard to them of the Government and (in the case of the Great George-street block) of the Office of Works itself; the writer appears to have mixed up two totally different things.

The *Berliner Architekturwelt* is almost entirely occupied with the description and illustration of the Fest-Halle and adjoining gardens at Mannheim designed by Herr Bruno Schmitz. This seems to be going beyond the "Berlin architecture-world," as far at least as the work is concerned. The plan of the Mannheim Palace shows two blocks at right angles; a front one, rectangular in plan, containing the smaller concert-hall on the first floor, with a *salle des pas perdus*, or, as it is here called, a "Garderobe vestibule," on the ground floor; at right angles to this projects a larger concert-room with a semicircular termination, and a large chorus platform, evidently intended for those choral *lieder* performances on a large scale of which the Germans are so fond, and which they execute in a style to be found in no other country. Architecturally the block of building is rather remarkable and original, though marked by that restlessness and striving after novelty which is the bane of so much contemporary German architecture. The general lines of the building are based on classical architecture, but with exceedingly free treatment of details and a liberal employment of symbolical decorative sculpture. Part of this is grouped about two twin doorways, called respectively "Beethoven-Portal" and "Mozart-Portal," each with a colossal bust of the composer named, over the doorway, and symbolical figures on the flanking pilasters and over the cornice; also a pinnacle on each angle formed of an eagle treated with an Egyptian severity of line, which is the best bit of detail in the whole. The sculptured figures (apart from the eagles) appear to be on four different scales; the symbolism in the figures is certainly not sufficiently distinctive to characterise two such different arts as those of Mozart and Beethoven; and as to harmony or reserve of line, it does not seem even to be aimed at; the whole thing may be described as a kind of inspired scramble. This is a great pity, seeing that the idea embodied in these sculptured portals is a fine one, and the treatment in detail is in many ways original and suggestive; but there seems to be a total want of the perception of decorative treatment of the composition as a whole. The *ensemble* of garden effect shown in the general sketch of the lake, fountain, water-tower, and pergola is very good.

In the *Antiquary* Mr. Dukinfield Astley concludes his "Ramble round Thetford," and Mr. J. A. Clapham contributes a short but interesting article on "The Marmion Chapel and Tower" on the banks of the Ure, which brings within the historical pale a name that we are accustomed to think of only in connexion with the imaginary nobleman and warrior of Scott's poem. The Marmions, however, were a real family; Scott, with his instinct for fine-sounding names in poetry, probably attributed his questionable hero to that family purely on account of the heroic sound of the name. The Marmion tower was once the gate-tower of Tanfield Castle, and in Tanfield Church is the Marmion aisle, containing the sculptured tombs of various members of the Marmion family. Among the "Notes of the Month" we read that those who are carrying on the interesting discoveries at Caerwent are very anxious about funds to continue the excavations. The work, we are told, has already excited great interest among scholars in Italy and Germany as well as in our own country. Near the north city wall a building that appears to be an amphitheatre has been uncovered, and in another quarter an interesting house has just come to light. To finish this year's work nearly 200*l.* is required, and there seems, unfortunately, to be little expectation of obtaining it. In any other country but this public money would be devoted to continuing such a work; but England is hopeless in this respect. Those who wish to subscribe can communicate with Mr. A. Trice Martin, the Hon. Treasurer to the Caerwent Excavation Fund, at Bath College, Bath.

To the *Monthly Review* Mr. Langton Douglas contributes a well-written and valuable article on the artistic work of Duccio, with illustrations from several of his principal known works.

In *Harper* Mr. G. W. Ritchey, of the Yerkes Observatory, gives an account of recent photographing of the moon, with some fine illustrations, reproduced from photographs. It is hoped that by the use of telescopes of much greater focal length than have been hitherto used, photographs of the lunar surface to a much larger scale and with much fuller detail than has hitherto been obtained, will before long be practicable. With this object a telescope of 24-in. aperture and 165-ft. focal length is now being constructed under the personal superintendence of Mr. Ritchey, the writer of the article. Telescopes of this length are, of course, stationary horizontal tubes—they could not be worked on any other method, the image of the moon or other object to be observed being reflected into them by a clock-driven mirror. The instrument referred to will, when completed, give a photographic image of the moon 18 in. diameter, after an exposure of from two to five seconds. But whether we shall see anything of much more interest than we can see now on the moon may be a question. If we could see the scenic effect of a lunar landscape, as if standing on the moon, it would be something to our sense of effect; but with the largest telescope we are still only looking down on the top of it and constructing the probable effect in our mind by calculation. We know already that it is a bare and desolate scene devoid of life, and we shall hardly know any more. The following comment by the writer of the article, in regard to the most remarkable and effective of his present photographs, is worth quoting:—

"No more imposing group of craters exists on the moon than that shown in the illustration—Theophilus, Cyrillus, and Catharina. Theophilus, the lower of the three, is 64 miles across, and is the deepest of all visible craters. The circular rampart ranges from 14,000 ft. to 18 000 ft. in vertical height above the gulf within. The central mountains, so well shown in the photograph, are more than a mile high. But the most striking features of this crater are the vast radiating ridges and ravines of its outer slopes: some of these can be traced for a hundred miles from the crest of the rampart. Can they be the remains of lava-streams which at one stage of the volcano's activity overflowed the crater's rim? Imagine the sublimity, and yet the utter desolation of the scene, if we could stand upon the crest of the rampart, and look out upon those thousands of square miles of gigantic radiating ridges, or turning about, look down into the vast amphitheatre, the crater-floor 18,000 ft. below. There is no scene on the earth which approaches it."

The *Century* contains an article describing "Yellowstone Park as it now is," and one by Mr. F. W. Stokes on "An Artist in the Antarctic," which however is more interesting on account of its description of the scenery and the *fauna* than of the illustrations, which are chromo-lithographs of somewhat too startling a vivacity to be accepted. "New Light on Lhasa, the Forbidden City," is of some interest, as it appears that the Kodak has in recent years enabled some adventurous unbelievers to obtain surreptitious photographs of portions of the city, but we do not get very much of the results in this article; the most interesting illustration is one of the half-ruined palace of the ancient Kings of Tibet at Lhasa; a collection of truncated pyramids in rubble-walling, with narrow windows, above each of which is some kind of rudely-formed projecting hood to keep the sun off.

In *Scribner* Mr. Montgomery Schuyler, under "The Field of Art," considers the question of "The Sky-scraper Problem." In architecture he considers that the sky-scraper is still *ferae naturae*, and has to be brought under the reign of law. In short, he implies that the question is already being raised, whether the law should not take more severe cognisance of the sky-scraper, and cut down its height, at all events in positions where it is a nuisance. Mr. Schuyler ends his article by misquoting a line of an English poet—

"And that which brings it to some perfect end."

"That which *shapes* it," it should be. Tennyson was so careful a literary artist that you cannot misquote him without spoiling either the sense or the sound, or both.

The *Church Builder* (quarterly) contains an illustrated account of the condition of St. Peter's Church, Astley (Worcestershire), together with the proposals for repairing and restoring it, not all of which are satisfactory. The church evidently wants much repair to put it into a fitting condition for use as a church, which is all quite right; but why is it "hoped eventually to substitute fifteenth-century windows for the present debased and modern ones?" What is the value of "fifteenth-century windows" inserted in the twentieth century?

We have received a copy of the first issue of a monthly periodical entitled *Everyday Electricity* (26, Cannon-street, Manchester). It is a popular journal describing the uses of electricity as applied to domestic and industrial purposes. An article by Mr. Perren Maycock on "Wiring Specifications" gives some useful hints as to drawing up a specification for the electric wiring of a building. A special feature of this journal is that expert opinions are offered free of charge to all readers who qualify for this "privilege" by paying six months' subscription (1s. 6d.).

The current issue of the *Architectural Record* (New York) contains illustrations of a wooden church built in 1787 in the Connecticut Valley. It is to-day in practically the same form as when originally built, and though nearly deserted by the removal of the larger part of the surrounding population, is still kept in thorough repair by the remaining inhabitants, who rightly value it for its traditions and its excellent design, which is one of simplicity and dignity suitable to a church, even though built of wood. A note on the "Improvement of the Chandelier for Gas and Electric Lighting" deals with the improvement of patent chandeliers, and professes to admire their artistic attempts towards merit. As a matter of fact, there are only about half a dozen firms who make sensible and beautiful light fittings, and these the writer of the present article and the large majority of the public would pass over with contempt! Emerson says somewhere "that the line of beauty is the line of perfect economy," a truth recognised by all true craftsmen, but by very few else. The architects' portfolio shows a beautiful view of Saint Ouen, Rouen, and three instances of good modern buildings.

APPRENTICESHIP IN ENGINEERING TRAINING.*

The subject of this discussion is wide and complex, and as the scope of the title may be misunderstood it is well at the outset to make it clear, although it may seem, at the same time, to be extended and restricted. "Engineering" is to be understood as including all branches—to be, in fact, civil engineering in the wide meaning of the term. The use of the word "apprenticeship" may, to some indicate that only one or two branches of engineering are to be considered, and to others it may seem that it is the training of the workman which is to be the subject of the discussion. But an apprentice is simply a "learner"; whatever be the branch of engineering, or whatever be the aim or the ultimate end of a young engineer—whether he is to be a workman, or whether he is to be an employer—during his apprenticeship he is a learner. The title, therefore, includes "pupil," although this term is sometimes used to distinguish a learner in certain branches, while in other branches it is used to distinguish the "paying" apprentice who aims at being an employer or designer, from the "paid" apprentice who becomes a workman. These extended definitions embrace too wide a field, and it is necessary to limit it by confining ourselves to the training of youths who are destined to be employers, manufacturers, or consulting engineers, designers, heads of departments, technical managers, and men in responsible positions. Whether or not such an apprentice should pay or be paid is a matter for the decision of individual engineers, or engineers in different branches, and this question may, therefore, be left out of the discussion.

Until the beginning of the last century entrance into the trades and the professions could only be obtained by means of an apprenticeship extending over seven years, during which the apprentice was bound to serve a master, who on his part undertook to keep the apprentice and to teach him his work. The system, as it then was, led to many abuses, and the Act of 1814 was designed to counteract these. It opened wide the doors to all except a few professions, and no restriction was placed either on the manner in

* An address by Professor John Dewar Cormack, B.Sc., A.M.Inst.C.E., delivered in June before Section III. (Machinery) of the Engineering Conference of the Institution of Civil Engineers.

which a youth learned his future occupation, or the duration of his training. At that time engineering, except in a few branches, was just emerging from its position among the crafts. The removal of the restrictions to entrance may have been harmful in some ways, but at all events it allowed free entrance to many men who, although trained for other pursuits, became pioneers in different branches of engineering. Although the restrictions were removed there still remained the idea that the proper way to become an engineer was to spend a period of five years or seven years in the workshop or office. Probably, then, in the existing state of what we are now proud to call the profession this was desirable, but now, after a century which has seen vast developments in engineering practice, and during which, with ever-increasing rapidity, scientific discovery is turned immediately to practical utility, it seems reasonable that some more generally recognised system of apprenticeship should be devised or recommended to suit the new conditions.

The inadequacy of the old system of apprenticeship has been realised for some time; so long ago as 1866, Sir John Fowler laid stress on the importance of combining the study of science and engineering theory with the ordinary apprenticeship. Since then it has become more generally recognised that the proper training for an engineer involves training both in theory and practice, and this has for the past seven years been emphasised by the Institution in demanding a knowledge of theory from candidates for Associate membership. When the technical education fever was at its height, opinion, to some extent, went to the other extreme, and it was thought by many that at last we had arrived at the solution of the problem. The numerous universities and technical colleges were expected to be able to turn out young engineers equipped not only with the necessary technical knowledge, but with experience gained in the college workshops.

In the United States and on the Continent this system of training has been, to a large extent, adopted, but there are indications of an increasing tendency to diminish the workshop practice in the colleges, and to substitute a training in workshops under commercial conditions. Especially in the case of the United States does one see excuse for such a system, for the extraordinary rapidity of the increase of engineering business there has created a corresponding demand for young men, possessed of scientific knowledge and some technical training, and capable of filling responsible positions. In this country, however, starting with a pre-eminent position in engineering, we have advanced with the times, perhaps at a less rapid rate than elsewhere, but still with sufficient prosperity. Interest in the training of young engineers has not been so generally aroused. Biassed as some were by the old traditions, infected as were others by the technical education fever, the advice given to our young engineers has been very varied, with the result that at present training is, in some quarters, found to be in a rather chaotic condition.

The ever-increasing keenness of international competition urges us to a solution of the problem, and this alone should be sufficient; but the call seems still more emphatic when we remember that the function of the engineer is "to direct the sources of power in nature to the use and convenience of man," and realise his cosmopolitan duties. The beneficial directing of the forces of nature implies a knowledge of the laws governing their behaviour. The definition of the title "civil engineer" demands from him both theoretical knowledge and practical experience, and in this discussion I think we may take as agreed that both are essential in the training of the engineer.

The Institution has for many years devoted most careful attention to the conditions of training which should be fulfilled by those coming under its purview. The "regular training" prescribed by its by-laws is defined by the Council's rules to involve a *minimum* period of three years' pupilage or training as an assistant, where the standard of education is simply that required for admission as a student; and such *minimum* period of practical training may be reduced to two years where a recognised college course of study is taken. In each case the practical training must comprise both experience in the office and in or upon the works.

The Institution clearly contemplates a scientific and a practical training for all, and, taking this as a matter of common agreement, the questions to be discussed are:—

1. How should the knowledge and experience in each be acquired?

2. Is there any arrangement suitable for all branches of engineering, and if not, what modifications are required for the different branches?

3. Over what period of time should the complete training extend, and what is the best arrangement and division of the time?

Let us look for a moment at the raw material and the finished product, leaving out of account the genius who may achieve eminence in engineering without special training. The raw material is a youth of seventeen or eighteen, fresh from school, educated, perhaps, to a standard below that which might be desired or expected, and supposed to be endowed with common sense, natural aptitude for the profession, and sufficient physical strength; and the finished product is a blend of scientific and technical knowledge, practical experience, and business method. Our colleges should supply the first two requirements, but I venture to submit that the last two can only properly be acquired in the workshops and offices, and that no training can be considered efficient that does not include a considerable period of practical apprenticeship. Colleges may supply knowledge relating to the properties of materials, the theory and structure of machines, instruction in testing and in the methods of attacking new problems; but it is only under actual commercial conditions that there can be acquired the proper type of practical experience, adequate knowledge of the design and construction of machines, experience of and sympathy with the workman. It is in the factory or office that there can be gained, by observation and imitation, some knowledge of routine, estimating, organisation, and management, business methods and administration, the production of the maximum amount of work with the minimum friction and at the minimum cost. Imitation of good example counts for much in engineering as in other professions, and to this, no doubt, can be largely traced the continuance of the success of our national engineering, despite our comparative slowness in advancing with the times. It is in this respect that Continental and American systems of training will be found deficient. There the young engineer is launched into his future occupation after a college training of four or five years with workshop experience gained, especially in America, only in the college, and with sometimes a total commercial experience of a year or less.

It is seldom that a youth when he enters the profession knows what special line he will eventually follow. The organisation of this Engineering Conference indicates at least seven important branches of the profession. He may be trained as a mechanical engineer and eventually end as a railway engineer, an electrical engineer, or a naval architect. There is no broad line of distinction, the branches being so closely related. The mechanical engineer must not build machines without considering the purposes for which they are intended. The dynamo manufacturer cannot look at a combined set solely from the commutator or collector end; the railway engineer cannot confine his knowledge to the finished girder or the finished locomotive, and the naval architect is not concerned simply with the lines or hull of a ship.

Underlying all branches there is to some extent the same practical foundation. All demand knowledge of the properties and uses of materials of construction, and of the methods and processes by which they are converted into structures and machines. In many of the branches it is generally realised that a man must go "through the shop," and after all, the processes in one "shop" do not greatly differ from those in another. Workshop experience is not, however, generally included in the training of all engineers, but surely it is desirable for all, and especially and increasingly so when steel has displaced to a large extent masonry and timber, when all types of motors bulk largely in their work, and when machines of all kinds are utilised to construct to their designs.

If it is considered desirable that the training of all engineers should include experience in suitable workshops and factories, specialisation being confined more or less to the drawing-office, the question under discussion is limited to the consideration of the time required, and the best division of that time between the college and the workshop. The duration of training depends to some extent upon the arrangement of the course; but, probably, it may be safely said that to produce the ideal young engineer the training should extend over five or six years, which might be about equally divided between the college and the workshop.

Is there any one system that is the most desirable? I leave it to discussion chiefly by engineers in practice, as I feel certain that the colleges are anxious to have a solution of this problem, and to adapt their courses to any scheme or schemes that may be thought desirable.

In this country at the present time the systems in operation might be classed as:—(*a*) 1 and 2, "separate" systems; (*b*) 3 and 4, "combined" systems; (*c*) 5 and 6, "compromises."

1. *Workshop only.*—This is a survival of the old traditions. It demands physical exertion during the day and mental strain at night if theory is to be acquired. Many eminent men in the past have undergone the strain and emerged successfully; but in the future the ever-increasing demand upon the engineer will render it unpractical, and almost impossible. Many clever youths enter the shops on this system with limited opportunities but with great ability, and provision should be made for them in any scheme of training.

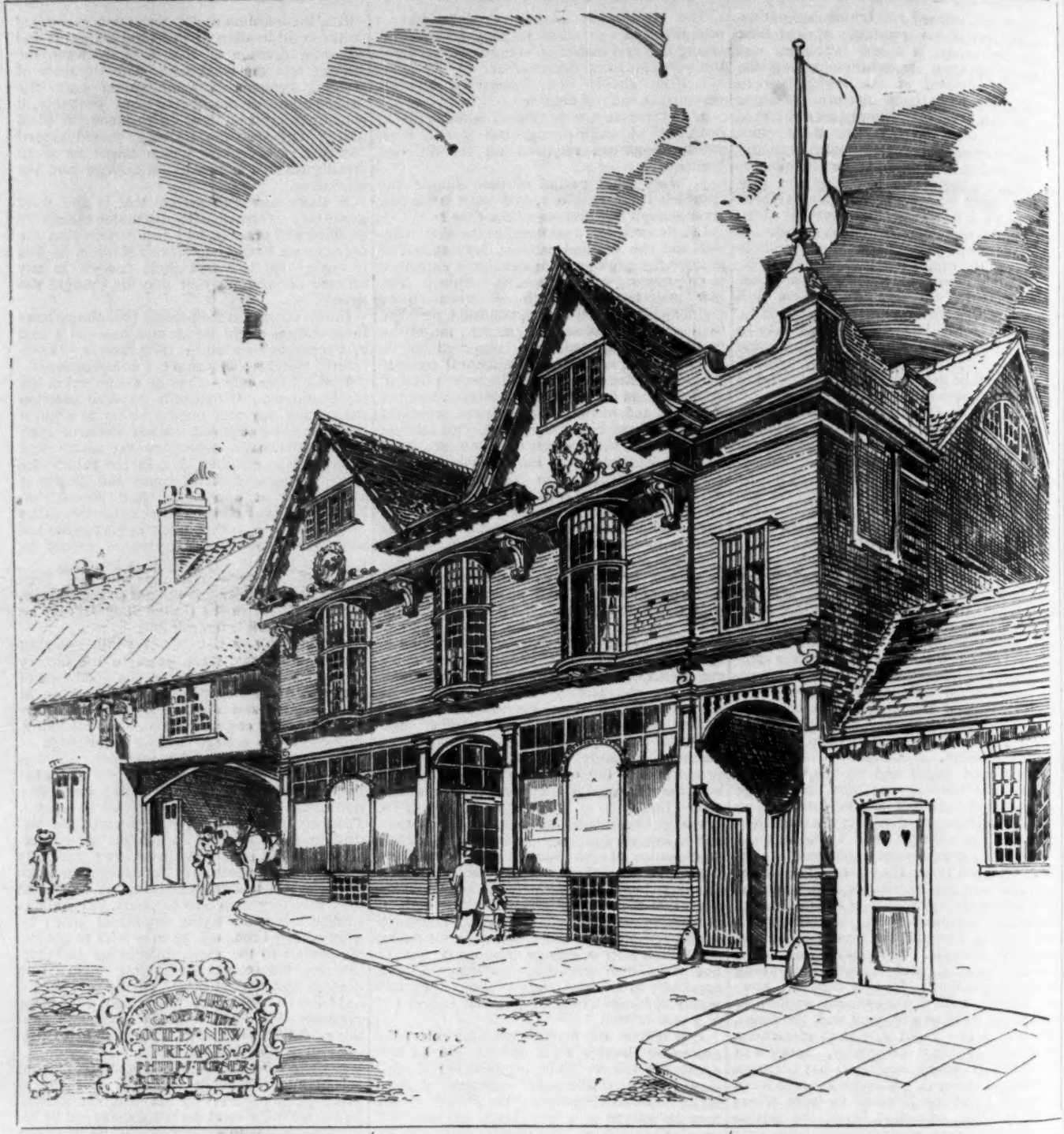
2. *College only.*—This has already been alluded to. Under exceptional circumstances, such as obtain in the United States, it may be expedient, but it is undesirable.

3. *Works before College.*—A youth entering college after, say, three years in the factory and office is in many respects a good type of student. He has gone through the shops at the receptive and imitative age; he has ascertained whether engineering is still to his liking, and comes to college with a knowledge of processes, materials, and machinery. He has some idea of what he wants to know and what branch he wishes to enter; but has often wrong theories which are difficult to uproot. Teachers prefer this type, provided he has continued his studies during his apprenticeship; but this is not always or even generally the case. The youth may have forgotten much of his school training, and, what is worse, he may have forgotten how to study. If he has studied it is under trying conditions, when he is physically tired, and he may wish to confine his studies to the more interesting technical subjects, the science underlying them being more or less neglected, and in consequence his progress is less rapid. He comes to college probably disinclined to begin again and gain the scientific knowledge which ought to precede all its applications.

4. *College before Works.*—A youth fresh from school and sufficiently educated is likely to make good progress in his scientific studies. In the technical work he is handicapped by his want of knowledge of manufacturing processes and the operation of machines, and is unable to associate his theoretical studies with practical examples of which he has had experience. Laboratories help to some extent to reduce the handicap. If this was to be the standard training there would be a greater plea for college workshops, which would supply some little practical experience, but which could not supplant, even partially, the workshop training under commercial conditions. Some may urge that this system produces a man disinclined to undergo what he calls the "drudgery" of the workshops, but others will be as ready to admit that the proper type of youth acquires his practical experience at a much more rapid rate after he has undergone a college training, and has no such disinclination. This system may be preferred by employers as distinguished from system (2), which may be preferred by teachers.

Other systems are in vogue, either by accident or design, whose object is to avoid the disadvantages connected with "separate" and "combined" systems or to minimise the required period of training.

5. *Intermittent Systems.*—These include the Works-College-Works and College-Works-College systems. Many arguments can be advanced by the advocates of each. The first arrangement has to a lesser extent the disadvantages attached to system (3), and the latter system those of system (4). Both waste time in so far as the usual college terms extend over only nine



months of the year, and the remaining three months may be wasted, as few engineers care to take youths for three months in the year. But probably, on the whole, this system is preferable to (3) or (4). In the College-Works-College system the youth fresh from school has an opportunity of acquiring a foundation of science on which to rest his works' experience; but if study is not continued his knowledge may evaporate in the works, and at the end of his training he is out of touch with his employers.

6. *Sandwich System.*—This system goes one step further. During a period of, say, five years training, for four years, six months of each year are spent in the factory or office and six months in the workshops, and the additional year is spent in the workshops or office. It lessens the discontinuity between the two parts of the training and effects a saving of time, inasmuch as the college long vacations are utilised. An objection which may be put forward is that the youth is always "on the move." He has no time to settle down to either the workshop or college work, and he may have difficulty and extra expense in arranging for lodgings. It must not be forgotten, however, that each part of his work forms a recreation for the other, and the student is likely to return to each with considerable keenness.

7. *Concurrent Systems.*—These either give time for study in classes in connexion with workshops, or offer workshop training in connexion with college. Both systems have already been alluded to.

The objections to (1) and (2) may be applied here. Time taken off the workshops for study gives less time for the practical experience, and this is not acquired under strictly commercial conditions. Except in the very largest works it is impossible to provide the requisite standard of teachers, and if it is necessary that the youths should breathe the atmosphere of the shops, probably it is perhaps equally necessary for him to breathe the atmosphere of the college.

The list may not comprise all the systems in vogue, and the arguments for and against them are merely indicated, but it serves to emphasise the diversity of the ways in which a youth may enter engineering. Is it not possible, at least to some extent, to standardise the training?

Leeds Water Supply Arbitration.—Lieut.-Colonel W. H. Wellsted, the umpire upon the claim recently heard at Westminster of Lord Masham against the Leeds Corporation, has just issued his award. The arbitration had reference to the compulsory acquisition of 395 acres of freehold land, belonging to Lord Masham, for the purposes of the Leeds new waterworks. The claim was for 196,000*l*. The valuations of the expert witnesses called by the Corporation amounted to 27,000*l*. The umpire has fixed the amount of purchase at 46,489*l*.

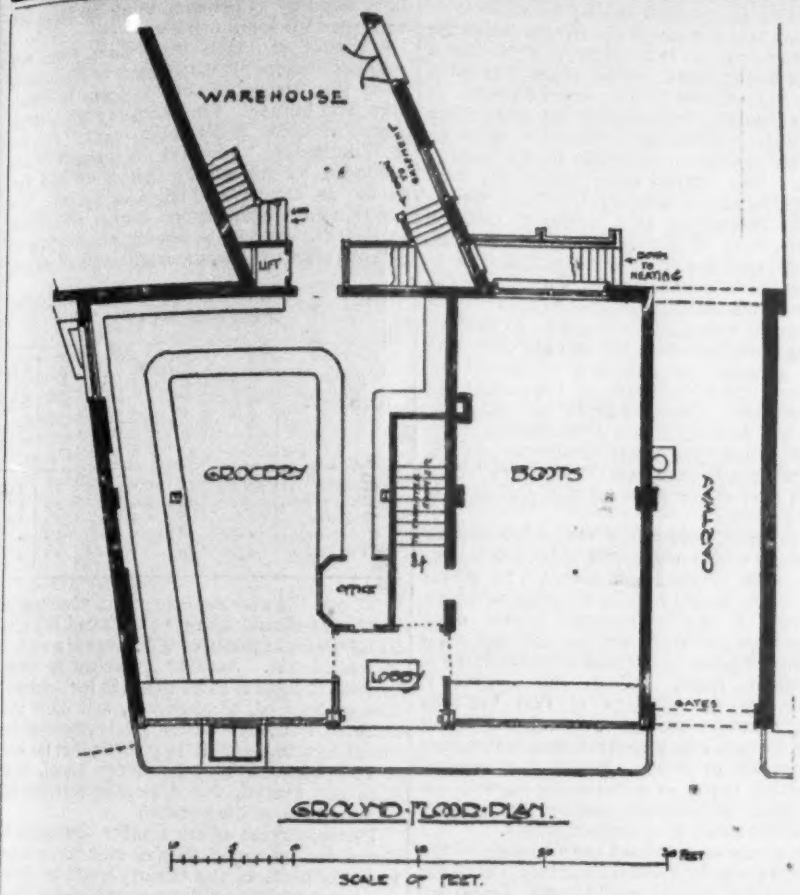
REBUILDING OF BUSINESS PREMISES FOR THE STOWMARKET CO-OPERATIVE SOCIETY, LTD.

The new buildings which are now being erected in Bury-street will consist of a grocery and a boots shop on the ground floor, entered from the street through a common lobby. An oak staircase from this lobby to the first floor will form the entrance to the committee-room (27 ft. by 16 ft.), secretary's office, lavatories, &c., and a large room (33 ft. by 24 ft.) for a proposed future department of the Society's business. Under the shop there will be a large basement with heating chamber, and a warehouse at back, two stories in height.

The whole of the woodwork of the front is being carried out in oak, with red brick facings, and green glazed bricks under the shop fronts. The overhanging gables will be finished in rough cast, with ornamental plaster panels executed by Mr. Geo. P. Bankart, of Bromsgrove.

The shop fittings are being made by the Wholesale Co-operative Society, Ltd., Broughton; the steel casements by Messrs. Henry Hope & Son, Birmingham, and the constructional steel work is being supplied by Messrs. Drew-Bear, Perks, & Co. The heating will be by low-pressure hot water with radiators, and the lighting by electricity.

The builders are Messrs. Scales & Robins,



Stowmarket Co-operative Society's Premises.

Cambridge, and the architect, Mr. Philip J. Turner, of Stowmarket, Suffolk, and Westminster, S.W.

COMPETITIONS.

SOLDIERS' MEMORIAL, KINGSTON-UPON-HULL.—The first premiated design in this competition was by the Leeds Slate and Marble Co., Ltd., Leeds, and the second by Messrs. J. Whitehead & Sons, London.

MAIDENHEAD LIBRARY COMPETITION.—We are informed that there was a slight error in our paragraph under this heading last week. Messrs. A. McKewan, A.R.I.B.A., and G. H. V. Cale, of Birmingham, were placed second by the assessor, not "McEwen & Kale," though we may say that we printed the information as it was sent to us.

ELECTRICITY FOR SMALL HOSPITALS.*

ALTHOUGH electric light is now fairly universal in large hospitals, it is too seldom adopted in small institutions situated in more or less remote districts where public supplies of electricity are not available, and in many small institutions where the engineering equipment is of very limited character. Moreover, the convenience and economy of electricity for the provision of power and heat in hospitals are still inadequately recognised.

In districts where current is obtainable from the systems of municipal or industrial corporations, it may often be thought advisable to buy the current required. Such a decision may be influenced by the laudable desire to support an industry conducted by the local authority; by the low rates charged in a particular district; or, in the case of a very small hospital, by the consideration that outlay for the establishment of a separate source of supply would be unjustifiable. The sale price of energy varies very much in different places, and not always proportionately with the price of coal, which is the factor chiefly governing the cost of actual production. In many districts those employing current for power receive specially favourable terms, and this introduces another element for consideration. Charges for lighting are almost invariably based upon what is termed the "maximum demand system," according to which the rate for the first hour is generally double the rate for succeeding hours. This method has the effect of levying from all consumers a fair proportion of expenses incurred over and above the actual cost of energy at the works, and it also has the advantage of encouraging the consumption of current for a larger number of hours. To illustrate the variable nature of charges, some figures are quoted in Table I. from accounts recently published for the year 1902. Although these data were not specially selected, they show fairly well the rates prevailing in towns where local conditions are essentially different.

Table I.—Charges for Light and Power in 1902. In Pence per Board of Trade Unit.

Place.	Light.	Power.	Average (net).
Huddersfield .	4·5d.	2·5d. & 1d.	3·75d.
Hull	5d. & 2d.	2·0d. & 1d.	3·80d.
Northampton .	6d. & 3d.	2·0d	4·70d.
Worcester....	4·7d.(average)	3·48d (average)	3·77d.

While the general average is only 4·00d. per unit, considerably more is payable for energy used for lighting, and inspection of the figures shows clearly that the purchase of current is less advantageous for hospitals where electricity is employed for lighting alone, than for those where it is utilised in the provision of both light and power. On comparing Tables I. and II., a very important difference is seen to exist between the sale price and the cost of energy, and, moreover, the sale price does not appear to be governed by the works cost. The difference between cost and sale prices is accounted for by the expense of distribution, general trading expenses, and profit. In the case of a public hospital, the equipment of a generating station involves no liability in respect of rent, rates, and taxes, and its operation adds practically nothing to the cost of management. All modern hospitals possess steam boilers and auxiliary plant, and thus the motive power for generation can be furnished at far less cost than in an establishment where boilers have to be specially worked for electrical machinery. The cost of attendance will be very little increased, or may not be increased at all. It is a generally accepted rule that a given product cannot be manufactured so economically in small establishments as in large works, but there is reason for anticipating that the cost rate per unit of electricity generated in a public institution should be less than the average sale price charged by electricity supply corporations. It may here be added that, according to a recently-published summary of electric supply records for 1901, the average works cost in Great Britain was 1·74d., and the average price obtained for light and power was 4·47d. The highest and lowest prices were 7·06d. in Harrow, and 2·41d. in Prescot.

Table II.—Works and Distribution Cost of Electric Energy in 1902. In Pence per Board of Trade Unit.

Items.	Huddersfield.	Hull.	Northampton.	Worcester.
Fuel	·37d.	·84d.	·46d.	·63d.
Water & Engine-room Stores ..	·05d.	·07d.	·04d.	·07d.
Wages for Generation, Distribution, &c. ..	·44d.	·53d.	·69d.	·44d.
Maintenance ..	·31d.	·31d.	·33d.	·31d.
Totals.....	1·17d.	1·75d.	1·52d.	1·45d.

We will next inquire into the probable cost of producing energy in a hospital generating-station. In the first place, it may be convenient to define the machinery and appliances required, and to indicate the relation between capital expenditure and output.

The absolute essentials of a generating plant are the following:—

1. Prime mover—furnishing motive power by the agency of steam, gas, or oil;
2. Dynamo—generating current at the required voltage;
3. Main switchboard—for the regulation and distribution of current.

To these it is usually desirable to add—

4. Storage battery—the cells varying in number with the required voltage, and in capacity with the discharge in ampere-hours.

Steam and other engines are now provided with such efficient means of control, and dynamos are made to run so steadily that the storage battery is not so much a necessity as a convenience. In hospitals where electric energy is simply used for lighting, the generating set is, or ought to be, quite separate from the engine employed for driving laundry and other machinery, and the installation of a battery permits the storage of electricity during the day, when steam can conveniently be spared. Thus the generating plant need only be operated for a few hours daily, and current required in the evening can be drawn entirely from the battery. In cases where energy is applied both for light and for power, the battery can be slowly charged throughout the day, and used (either alone or in conjunction with the generator) for carrying the evening load. As the voltage required for charging a battery is about one-third more than the normal voltage, it is evident that some means of adjustment must be provided if charging is to be conducted while the generator is being used for other purposes. The most satisfactory method is to add a machine of the type known as a "booster," which is capable of raising the voltage of current from the ordinary circuit to the voltage necessary for charging. As usually made, the booster consists of a small dynamo and a motor of suitable power, combined to form a self-contained and very compact machine. The booster is also made without the motor, and in this form it can be driven from the shaft of the main generator, or in any convenient manner. In special cases, where highly-fluctuating loads occur, owing to the sudden starting of machines absorbing considerable amounts of power for a few moments, a booster can be applied in connexion with a small regulating battery, and so connected that the average current of the variable load may be supplied as a constant load, the battery being charged while there is little or no demand for power, and discharged heavily when the momentary strain comes on; thus adding to the normal supply from the booster sufficient current to meet the augmented demand. Such an arrangement prevents injurious shocks in the generating set, and various unsatisfactory disturbances of the service generally.

For the purpose of affording a basis for calculation, a small power station recently

* Part of a paper by Mr. W. N. Twelvetrees, A.M.I.E.E., M.I.Mech.E., read at the recent Sanitary Institute Congress at Bradford.

equipped under the direction of the author will be taken as an example. This installation was designed simply for lighting, but it would be quite capable of dealing with a moderate power-load in addition. The capacity of the plant is 10 kilowatts, or 100 amperes at 100 volts, which is sufficient for the continuous supply of 155 16 candle-power lamps. The storage battery has a capacity of 216 ampere-hours when discharging in six hours, and the rate of discharge is then 36 amperes per hour. This capacity is sufficient for the present requirements of the institution, and is equivalent to annual output of about 8,000 Board of Trade units. Motive power is provided by a quick-revolution vertical engine, operating a belt-driven bipolar continuous-current dynamo, and steam is furnished from the boiler provided for the general supply of heat and power for ordinary purposes. The cost of the machinery and plant, erected in working order, was 475*l.*; but to this should be added the amount of 100*l.* to cover the increased cost of boilers, owing to the higher pressure necessary for the electric-light plant. The total capital expenditure is thus brought up to 575*l.*

In considering the further outlay required to make the plant available for power as well as for light, it is only necessary to add the cost of providing and fixing a booster, say, 100*l.*; as the value of the laundry engine and auxiliaries is about the same as that of the electric motor and fittings that would be required instead. Thus, 675*l.* represents the total capital value of the plant for light and power. If fully employed for light and power during five days a week, and for light alone during the remaining two days, the annual output would become 23,000 units.

Calculated upon the amounts stated above, the annual repayment of principal with interest at 3 per cent., extending over twenty years, would be 40*l.* for lighting alone, or 47*l.* for light and power. The amount to be included in the total cost of energy on account of repayment and interest is consequently 1·2d. per unit in one case, and 0·5d. per unit in the other.

In a steam plant, coal is the chief item for consideration. Taking the consumption at 7 lbs. per brake horse-power, or, say, 10 lbs. per kilowatt, the cost with fuel at 15s. per ton comes out at 0·8d. per unit. Water and engine-room stores may be put down at 0·07d. per unit; an increase of 1s. a day in the engine-driver's wages would represent 0·55d. per unit on the output of 8,000 units, or 0·2d. per unit for the output of 23,000 units. Including 5 per cent. on the value of the plant for maintenance and repairs, and including also the items in respect of repayment and interest, we have the figures stated in Table III.

Table III.—Estimated Cost of Electrical Energy in Hospital Installation. In Pence per Board of Trade Unit.

Items.	Light only.	Light and Power.
Fuel	·80d.	·80d.
Water and Engine Room Stores	·07d.	·07d.
Attendance (extra)	·55d.	·20d.
Maintenance	·75d.	·37d.
Works Cost	2·17d.	1·44d.
Repayment and Interest	1·20d.	·50d.
Total Cost	3·37d.	1·94d.

Results such as these are only to be attained if the entire plant is properly designed and managed. The efficiency of all details must be considered, and capacity must be duly proportioned to the required duty. The boiler plant must be designed so that perfect combustion of the fuel may be secured, stoking should be effected by mechanical means, and the excess heat contained in the furnace gases should be utilised by the employment of fuel economisers. Every available means should be adopted for utilising exhaust steam and water of condensation, and loss of heat from the surfaces of the boilers and steam-pipes should be minimised by suitable non-conducting material. Unless precautions such as these be taken, the cost of electricity will be materially increased, although it is most likely that no accounts will be forthcoming to demonstrate the fact.

So far as structural work is concerned, very little outlay is involved in the application of electrical plant in a hospital. In new buildings the dimensions of the ordinary boiler-house need not be increased, unless space has been unduly economised; an engine-room of average size will be ample for the generating set and main switchboard, but space must be found for the accommodation of the storage battery. The battery-room must be well ventilated in such a manner that acid vapour may be discharged at a sufficient distance above the roof. The floor should be asphalted or tiled, and made with a suitable fall to prevent the accumulation of water, and the interior walls, roof, and timber fittings should be protected with acid-proof paint. In existing buildings, where boilers are already provided, it will generally be necessary to extend the boiler-house to afford space for the addition of another boiler. If this should be impracticable, or, owing to exceptional circumstances, undesirably expensive, it may be advantageous to leave the boiler-house as it stands and to make use of a gas or oil engine for the provision of motive power.

The internal combustion motor has several advantages which commend it for use in connexion with electric generators. In places where steam is not required for other purposes, this type of engine provides power more cheaply than the steam engine, and one great advantage it possesses is that of adaptability to intermittent work. When the engine is stopped the consumption of fuel instantly ceases, whereas in the case of the steam engine, there is continuous waste of fuel during the intervals of work. Hence the internal combustion motor is particularly suitable for very small institutions, where the general demand for steam is of limited extent.

Only a year or two back the running of the gas engine was far from satisfactory, but at the present time several well-known firms are making special types of electric light engines that give a perfectly steady current without the application of a fly-wheel to the dynamo, as was formerly necessary. Another improvement is to be found in the diminished consumption of gas, and various engines are now to be obtained in which the volume required per brake horse power is between the limits of 15 cubic ft. and 25 cubic ft. per hour. As our attention is devoted particularly to electricity for small hospitals, we will take the consumption of gas at the upper limit of 25 cubic feet per b.h.-p., or, say, 37·5 ft. per kilowatt. With gas at 2s. 6d. per 1,000 cubic ft. the cost of energy works out at about 1·12d. per unit. Substituting this value for the cost of coal given in Table III., we find that the total cost of generating energy in a gas-driven plant to be 3·69d. per unit for light alone, or 2·26d. per unit for light and power. At the average rate of 30 cubic ft. per kilowatt, the cost of production would be 3·47d. in one case and 2·04d. in the other. No alteration is necessary in the item referring to repayment and interest, because the higher cost of the gas engine practically balances the saving in respect of the amount allowed for increased boiler power.

Before leaving gas-engines, it may be well to direct attention to the efficiency of gas employed in direct lighting, and in electric lighting through the medium of a gas-engine. The amount of light furnished per cubic foot per hour by the three best-known forms of gas-burner is stated in Table IV., the burner in each case being new and in perfect condition.

Table IV.—Light Given in Direct Lighting by One Cubic Foot of Gas.

Type of Burner.	Candle Power.
Batswing	2·75 to 3·00
Argand	3·00 to 3·50
Incandescent	12·00 to 15·00

When consumed in a gas-engine at the rate of 37·5 cubic ft. per kilowatt, each cubic foot of gas will give 6·65 candle-power in the form of electric light—approximately 2·3 times the light furnished by an ordinary burner, twice that by an argand burner, and half that by an incandescent burner. Although the superiority of the incandescent burner is very marked at first, its economy is not maintained. In about 100 hours the efficiency has fallen off more than 25 per cent., and in 300 hours more than 33 per cent. Similar loss of efficiency is found in the incandescent electric lamp, but not in the same degree, for the original candle-power is not diminished by 33 per cent. until the lamp has been used for some 600 hours.

A matter of much importance, from the hygienic standpoint, is the effect of illuminants upon the atmosphere of the space in which they are burned. The following table, taken from Dr. Louis Bell's recent work, "The Art of Illumination," gives the approximate effects produced by the combustion of oil and gas, so far as concerns vitiation of the air. The fact that each ordinary gas burner will vitiate the air of a room to the same extent as five adult persons is a strong argument in favour of electric

Table V.—Vitiation of Air by the Combustion of Oil and Gas (Bell).

Illuminant.	Quantity per hour.	Candle-power.	Oxygen consumed. C. ft.	CO_2 produced. C. ft.	H_2O Vapour C. ft.	Vitiation in adult persons.
Paraffin oil	992 gr.	16	6·2	4·3	3·3	7·3
Kerosene oil	969 gr.	16	5·9	4·1	3·3	7·0
Gas (batswing)	5·5 c.f.	16	6·3	3·8	7·3	5·0
„ (Argand)	4·8 c.f.	16	5·8	3·6	6·4	4·3
„ (Welsbach)	3·5 c.f.	50	4·1	1·8	4·7	3·0

light, and the enormous hygienic advantage to be gained should alone be sufficient to justify its adoption in place of gas, even at a slightly increased cost. Another argument in favour of electric light is to be found in the deterioration of painted, distempered, and other surfaces in buildings where gas is employed for direct lighting, and it is possible that the cost of re-decoration may frequently equal, if it does not exceed, the difference between the two methods of illumination.

The oil-engine offers another alternative to steam for the generation of electrical energy. In many parts of the country it will be found more convenient and more economical than the gas-engine. For small country hospitals, where no public supply of gas is available, the oil-engine often presents the most economical means of providing motive power for the generation of electricity. In design the oil engine is practically the same as the gas-engine, with the addition of a vaporiser at the end of the cylinder. Any common form of petroleum oil may be used, such as Royal Daylight, Tea Rose, Broxburn, or Russolin. These and other oils of the kind are readily obtainable in any part of the country, and they have the recommendation of being both cheap and safe. The consumption in well-designed engines, as small as seven brake horse-power, is not more than 0·82 lb., or one-tenth of a gallon, per brake horse-power. Allowing 1·2 lbs., or 0·15 gallon per kilowatt, the cost of oil at 4d. per gallon does not exceed 0·6 per unit of energy produced. Substituting this value for the cost of coal as stated in Table III., we find the total cost of energy from an oil-driven plant to be 3·17d. for light alone, or 1·74d. for light and power. As before, no alteration has been made in respect of repayment and interest, as the value of the plant remains practically unaltered.

Comparing the efficiency of oil used for direct lighting, and for lighting by electricity through the medium of an oil engine, we find a considerable advantage follows the latter method of procedure. Table VI. contains a summary of some results obtained by Professor Vivian B. Lewes from a selection of twelve different lamps in use at the present day:—

Table VI.—Consumption of Oil in Direct Lighting, in Grains per Candle-power per Hour (Lewes).

Type of Wick.	American Oil.	Russian Oil.
Circular	60·32	75·11
Flat, Single	62·63	74·00
„ Duplex	53·70	51·25
Average	58·88	66·75

Taking the general average of 63 grains per candle-power as the basis of calculation, we find that the consumption of 63 grains of oil in an engine, at the rate of 1·2 lbs. per kilowatt, would produce 1·87 candle-power in the form of electric light, nearly double the amount obtained by direct lighting.

Reference to Table V. will show the effect produced upon the atmosphere of a room by the direct combustion of paraffin and kerosene,

and it will be seen that the volume of CO_2 is from 150 per cent. to 250 per cent. greater than that due to gas, and that one oil burner in the room has the vitiating power of from 7·0 to 7·5 adult persons.

Another form of fuel which is rapidly coming into general use for internal combustion engines is known as producer or power gas, a product which is destined to effect great changes in existing methods of developing power. In some parts of the country arrangements are already being made for the distribution of this gas on a large scale, and as it can be produced from the cheapest forms of fuel, the sale price will probably not exceed 2d. per 1,000 cubic ft. Allowing for the lower calorific value of this product, which is about one-fourth that of coal gas, the equivalent cost would be about 8d. per 1,000 cubic ft. In a plant of the size previously defined, the use of power-gas would reduce the cost of fuel to about 0·2d. per unit, and the cost of electricity to about 2·77d. per unit for light alone, or to 1·34d. per unit for light and power.

Some of the general results already ascertained are summarised in Table VII., and the cost of gas and oil are stated in Table VIII., in a form convenient for comparison.

Table VII.—Estimated Cost of Electrical Energy in Hospital Installation. In Pence per Board of Trade Unit.

Motive Power.	Cost of Production.			
	Plant partly used.		Plant fully used.	
	Works cost.	Total cost.	Works cost.	Total cost.
Steam Engine; coal at 15s. per ton....	2·17	3·37	1·44	1·94
Gas Engine; gas at 2s. 6d. per 1,000 cubic ft.—				
Average consumption.....	2·27	3·47	1·54	2·04
Maximum "	2·49	3·69	1·76	2·26
Oil Engine; oil at 4d. per gallon	1·97	3·17	1·24	1·74

Table VIII.—Cost of Gas and Oil for Direct Lighting, In Pence for a Quantity Producing the Same Candle-power as One Board of Trade Unit of Electricity.

Illuminant.	Average of Various Burners.	Batswing Burner.	Argand Burner.	Incandescent Burner.	
				New.	At 300 hours.
Gas at 2s. 6d. per 1 000 cub. ft.	1·55	2·61	2·30	·56	·75
Gas at 3s.	1.82	3·1	2·76	·67	·80
Gas at 3s. 6d.....	2·14	3·6	3·23	·78	1·05
Oil at 4d. per gallon..	1·12	—	—	—	—

It will, of course, be understood that these figures are merely intended to represent the cost of energy at the switchboard, or of illuminating material at the point of distribution. The figures relative to the generation of energy apply particularly to the installation which has been taken by the author as fairly representative of a small hospital plant, and although variations of output and working conditions have been considered, the results are not of universal applicability. Hence, it is impossible to institute an exact comparison between the calculated cost of electricity per unit, and the equivalent cost of gas and oil. Nevertheless, we may fairly assume that similar ratios will generally exist between the cost of the various methods of producing power and light.

The following conclusions may be drawn from the foregoing investigation :—

1. That electrical energy can be generated in a hospital of moderate size, even under unfavourable conditions, at a cost considerably lower than the average rate charged by public supply corporations.

2. That economical production is greatly aided by utilisation of the generating plant for power as well as for light.

3. That under favourable conditions energy can be generated at such cost that electric lighting becomes less costly than direct gas lighting when ordinary burners are employed, although more costly than gas-lighting by incandescent burners, and more costly than direct lighting by oil lamps.

4. That, in view of its deleterious effect upon the atmosphere, the combustion of gas and oil for the direct lighting of hospitals is distinctly inadvisable, and that these substances may be more advantageously employed in the provision of motive power.

5. That the facilities offered by modern gas and oil engines are such as to place electricity within the reach of all hospitals, for which the outlay upon generating plant has hitherto been regarded as unjustifiably heavy.

APPLICATIONS UNDER THE 1894 BUILDING ACT.

AT the meeting of the Building Act Committee of the London County Council, held on July 27, being the day before the Council adjourned for the summer recess, the proceedings were governed by the clause in the order of reference which empowers the Committee at certain seasons to act on behalf of the Council in relation to matters included in the Committee's order of reference :—

Lines of Frontage and Projections.

Paddington, North.—Buildings on the north side of Harrow-road, Paddington, westward of No. 474, Harrow-road (Mr. J. H. Bethell for the London and South-Western Bank, Ltd.).—Consent.

Chelsea.—A block of water-closet buildings on the north side of Lots-road, and of a block of water-closet buildings on the west side of Upcerne-road, Chelsea (Mr. T. J. Bailey for the School Board for London).—Consent.

Dulwich.—The retention of a wooden porch in front of No. 9, East Dulwich-road, Camberwell (Mr. A. J. Walke).—Consent.

Holborn.—A projecting clock at the second floor level of Nos. 82 and 83, High Holborn (Mr. M. V. Treleaven for Messrs. Boots, Limited).—Consent.

Lewisham.—Two iron and glass porches in front of Nos. 14 and 16, Chudleigh-road, Lewisham (Messrs. J. W. Heath & Son).—Consent.

Lewisham.—The conversion into shops of the bay windows of Nos. 66, 68, 70, 72, and 74, Brownhill-road, Catford, and the extension of such shops (Mr. I. Davis).—Consent.

Norwood.—Twenty-one houses with bay windows and porches on the north-east side of Holmdene-avenue, Herne Hill (Mr. E. Evans for Messrs. Gray & Murphy).—Consent.

Peckham.—A one-story shop upon part of the forecourt of No. 20, Rye-lane, Peckham (Mr. E. J. Strevens for Mr. E. Swiffen).—Consent.

Rotherhithe.—A one-story shop in front of No. 256, Southwark Park-road, Rotherhithe (the Empress Tea Stores, Ltd.).—Consent.

Westminster.—One-story shops and an entrance porch in front of No. 121, Victoria-street, Westminster (Mr. J. B. Martin).—Consent.

Woolwich.—That the application of Mr. A. E. Habershon, for an extension of the periods within which the erection of three houses at the south-east end of Elm-grove, The Slade, Plumstead, was required to be commenced and completed, be granted.—Agreed.

Hampstead.—A brick and timber porch at the entrance to "Caldecotts," Elsworthy-road, Hampstead (Mr. W. Willett).—Consent.

Kensington, South.—A porch and bay window in front of No. 3, Addison-road, Kensington (Mr. H. T. A. Chidgey for Mr. A. Wright).—Consent.

Kensington, South.—An iron and glass shelter at the entrance of No. 50, Holland-park, Kensington (Messrs. S. Dowsing & Sons, Ltd., for Mrs. Young).—Consent.

Kensington, South.—An oriel window in front of the proposed fire-station on the north side of Clarence-mews, High-street, Kensington (Mr. O. Fleming for the Fire Brigade Committee of the Council).—Consent.

Lewisham.—Houses, with bay windows, on a site abutting upon the northern side of Perry-vale and western side of Sunderland-road, and upon a site abutting upon the eastern side of Church-road, Lewisham (Mr. J. M. Kennard for Mr. M. E. C Christmas).—Consent.

Marylebone, East.—Retention of a bay window in front of No. 16, Langham-street, St. Marylebone (Mr. A. J. Hopkins for Mr. T. Stevens).—Consent.

Paddington, South.—A wood and glass conservatory at the first floor level of Inverness House, No. 4, St. Agnes-villas, Bayswater-road, Paddington (Mr. H. J. Appleton for Mr. J. B. Kennedy).—Consent.

Westminster.—A projecting porch in front of the Royal Horticultural Society's hall, on the site of Nos. 77, 78, 79, and 80, Vincent-square, Westminster (Mr. E. J. Stubbs for the Building Committee of the Society).—Consent.

Woolwich.—A projecting porch at the entrance to the Woolwich Town Hall on a site on the north side of Wellington-street, Woolwich, eastward of Upper Market-street (Mr. A. B. Thomas).—Consent.

Lambeth, North.—An addition to St. Thomas's Hospital, Lambeth Palace-road, to abut also upon Westminster Bridge-road, to the lines shown upon the plan, dated July 27, 1903, and (with the exception of any modifications that may be made by the President of the Royal Institute of British Architects) in accordance with the elevation submitted in connexion with the application of Mr. P. Currey on behalf of the Governors of the hospital.—Consent.

Wandsworth.—Houses on a site on the east side of Mitcham-road, Wandsworth, abutting also upon Vant-road (Mr. W. C. Poole for Mr. H. Keen).—Refused.

Hampstead.—A two-story building on the eastern side of Edgware-road, Hampstead, between the abutment of the Great Central Railway and No. 358, Edgware-road (Messrs. Done, Hunter, & Co. for Messrs. Neal Brothers).—Refused.

Kensington, South.—Buildings on a site abutting on the north-western side of Kensington-road and the eastern side of Melbury-road, Kensington (Messrs. Rolfe & Matthews for Messrs. Jones Brothers).—Refused.

Lewisham.—Nine houses upon the site of Walmer House, Perry Hill, Catford (Mr. W. Burrell for Mr. Leech).—Refused.

Marylebone, East.—Oriel windows in front of proposed buildings on the north-west side of Union-street, St. Marylebone, eastward of Candover-street (Messrs. Clark & Boulting for Mr. T. J. Boulting).—Refused.

St. George, Hanover-square.—A porch, water-closet and lavatory, with bay window over, in front of No. 7, Seamore-place, Park-lane, St. George, Hanover-square (Mr. J. A. Tregelles for Sir J. L. Mackay).—Refused.

St. George, Hanover-square.—A projecting wood and concrete bay window in front of the ground story of No. 17, Lower Belgrave-street, St. George, Hanover-square (Mr. W. Woodward, for Miss E. Kerr).—Refused.

Strand.—An iron and glass shelter in front of the Tudor Hotel, No. 86, Oxford-street (the Falkirk Iron Co., for the proprietors of the hotel).—Refused.

Wandsworth.—One-story shops in front of four houses on the south side of Replingham-road, Southfields, Wandsworth, westward of Elsenham-street, and of a one-story bakehouse addition to the easternmost house to abut upon Elsenham-street (Mr. D. Matthews, for Mr. G. A. Gale).—Refused.

Wandsworth.—A motor carriage-house adjoining "Carrick House," Ullathorne-road, Streatham Park, Wandsworth (Mr. F. D. Smith, for Mr. W. Christie).—Refused.

Width of Way.

Southwark, West.—A building on the west side of West-street, St. George's-road, Southwark, with external walls at less than the prescribed distance from the centre of the roadway of the street (Mr. T. J. Bailey, for the School Board for London).—Consent.

Deptford.—A building to abut upon the south side of Prince-street and the east side of New King-street, Deptford, with external walls at less than the prescribed distance from the respective centres of the roadways of those streets (Mr. J. H. Forbes, for Messrs. Vornberger & Co., Ltd.).—Refused.

Lines of Frontage and Width of Way.

Holborn.—A new stone facing to the flank of the Old Holborn Bars public-house, Holborn, to abut upon Staple-inn-buildings (Mr. P. M. Roberts for Mr. H. Finch).—Consent.

St. George, Hanover-square.—A one-story lavatory addition to the Grosvenor Hall, Buckingham Palace-road, St. George, Hanover-square, with external walls at less than the prescribed distance from the centre of the roadway of Flask-lane (Messrs. Woodrow & Heladou for the proprietors of the hall).—Consent.

Hammersmith.—A two-story addition at the rear of No. 93, King-street, Hammersmith, to abut upon Bridge-avenue (Messrs. Bull & Bull for Mr. J. Broughton).—Consent.

Islington, West.—An iron and glass shelter, in Macready-place, to the Marlborough Theatre, Holloway-road, Islington (Mr. F. Matcham for Mr. F. W. Purcell).—Consent. An iron and glass shelter to the entrance to the said theatre in Holloway-road.—Refused.

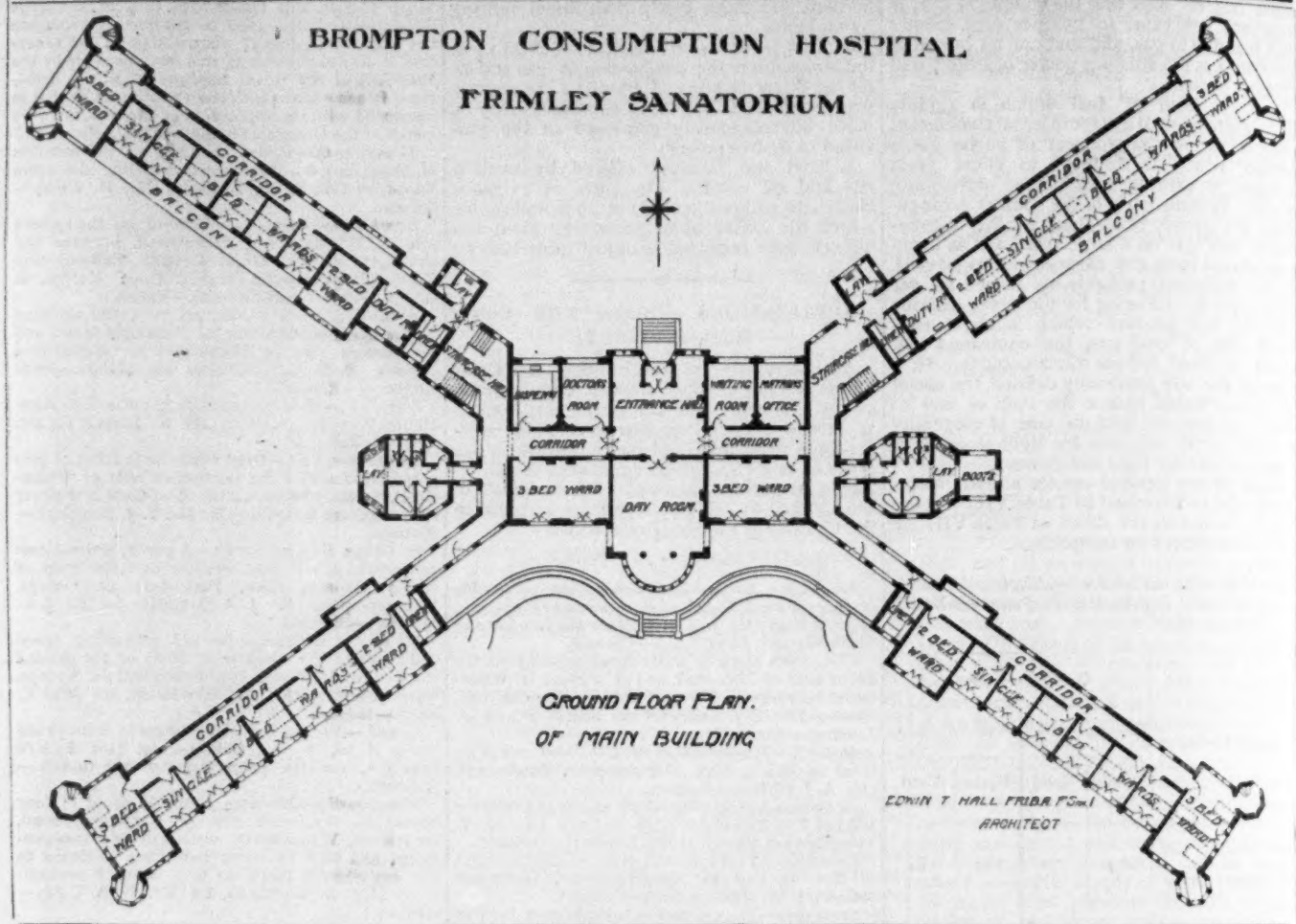
Wandsworth.—Residential flats upon the east side of River-street, Lower Richmond-road, Putney (Mr. R. C. Overton for Mr. R. Emerson).—Refused.

Chelsea.—A one-story shop upon part of the forecourt of No. 55, College-street, Chelsea, to abut also upon Pond-terrace, with external walls at less than the prescribed distance from the centre of the roadway of Pond-terrace, and such shop to the line in College-street (Messrs. Selby & Kislingbury for the Motor Car Industries Co.).—Refused.

Greenwich.—Four two-story cottages on the southern side of John Penn-street, Greenwich, to abut also upon the eastern side of Bennett-street (Mr. W. H. Ansell for Mr. J. W. Collins).—Refused.

Marylebone, West.—A projecting doorway in front of the coachhouse of No. 9, Bryanston-mews East, Bryanston-square, St. Marylebone (Messrs. Frere & Co. for the Hon. Richard Dawson).—Refused.

City.—An oriel window at the first, second, and third floor levels of a warehouse building on the



site of Nos. 27 and 29, Carter-lane, Godliman-street, City (Mr. E. Locke for Mr. W. J. Fryer).—Refused.

Width of Way, Lines of Frontage and Construction.

City.—A gangway across Freeman's-court, City, to connect No. 1 with the rear of No. 99, Cheapside Mr. B. Norman for Messrs. Viney, Price & Goodyear).—Consent.

Southwark, West.—A structure for a luffing crane on the north side of Bankside, and of a gangway across that street to connect such structure with No. 6, Bankside (Messrs. T. Osborn & Sons for Messrs. Harrison & Crossfield).—Refused.

Space at Rear.

Lewisham.—A house on a site on the southern side of Old-road, Lee, at the corner of Manor-lane, with an irregular open space at the rear (Messrs. Sills & Leeds for Mr. G. F. Havell).—Consent.

St. George, Hanover-square.—Alterations to No. 207, Regent-street, and No. 3, Conduit-street, St. George, Hanover-square, with an irregular open space about the premises (Mr. T. Kissack for Messrs. Fullers, Ltd.).—Consent.

St. George, Hanover-square.—Deviation from the plans approved on April 25, 1899, for the erection of a three-story dwelling-house (known as No. 1A, Belgrave-square) on a portion of the site of No. 1, Belgrave-square, St. George, Hanover-square, so far as relates to the erection of additions at the rear of, and alterations to, such dwelling-house (Messrs. Todd & Wrigley).—Refused.

Width of Way, Line of Frontage, and Space at Rear.

Hampstead.—Five blocks of flats upon a site abutting upon the south side of Dennington Park-road, and west side of Kingdon-road, Hampstead (Mr. G. H. B. Quennell for Mr. A. Bretzfelder).—Refused.

Width of Way and Deviation from Certified Plan.

Marylebone, East.—A building on the site of Nos. 120 and 122, Marylebone-lane, St. Marylebone, abutting also upon Cross Keys-mews (Mr. W. Woodward for Mr. S. H. Griffiths, trading as Messrs. Blyth & Co.).—Refused.

Formation of Streets.

Wandsworth.—That an order be issued to Messrs. Holloway Bros. sanctioning the formation or laying-out of a new street for carriage traffic, to lead from Lyford-road to Ellerton-road, Wandsworth.—Consent.

Hammersmith.—That an order be issued to Mr. E. Collins sanctioning the formation or laying-out of a new street for carriage traffic, to lead from Scrubbs-lane to Hythe-road, Hammersmith.—Consent.

Wandsworth.—That an order be issued to Mr. R. C. Overton refusing to sanction the formation or laying-out of new streets for carriage traffic out of the south side of Lower Richmond-road, Putney (for Mr. R. Emerson).—Refused.

Woolwich.—That an order be issued to Messrs. Tapp & Jones refusing to sanction the formation or laying-out of a new street for carriage traffic, to lead northward from Fernhill-street, Albert-road, North Woolwich.—Refused.

Wandsworth.—That an order be issued to Mr. W. Bartholomew refusing to sanction the formation or laying-out of a new street for carriage traffic out of the south side of Mitcham-road, Tooting.—Refused.

Means of Escape at Top of High Buildings.

St. George, Hanover-square.—Deviations from the drawings approved on July 31, 1900, showing the means of escape in case of fire proposed to be provided on the two top stories of a block of residential flats on the site of Nos. 1 and 2, Grafton-street (now known as Nos. 1 to 11, Hay Hill), St. George, Hanover-square (Mr. B. Slade).—Consent.

Westminster.—A deviation in the means of escape approved on April 5, 1898, proposed to be provided for the persons dwelling or employed in the two topmost stories of the Institute of Mechanical Engineers, Storey's Gate, Birdcage Walk, Westminster (Mr. E. Worthington for the Institute).—Consent.

Working-class Dwellings.

Kennington.—That the Council do make an order as follows—Whereas Mr. R. Robertson on July 14, 1903, under the provisions of Section 42 of the London Building Act, 1894, delivered on behalf of the Housing of the Working Classes Committee of the Council at the County Hall a plan of a block of intended dwelling-houses, to be known as "Clere-cottages," to be inhabited by persons of the working classes, and proposed to be erected, not abutting upon a street, on a site at the rear of Lennox-buildings, Wandsworth-road, Lambeth . . . . now the Council does by this order sanction the said plan so far as Section 42 of the said Act is concerned. . . . .—Agreed.

Buildings for the Supply of Electricity.

Strand.—The conversion of a generating-station at Maiden-lane, Strand, into a distributing-station (Mr. W. B. Pinhey for the Charing Cross and Strand Electricity Supply Corporation, Ltd.).—Consent.

Dwelling-houses on Low-lying Land.

Lambeth, North.—A building on low-lying land, being the site of No. 15, New Cut, Lambeth (Messrs. Flood & King for Mr. E. H. Ruscoe).—Consent.

Illustrations.

NETHER SWELL MANOR, GLOUCESTERSHIRE.

THIS house, situated not far from Stow on the Wold, is now being built. Local stone both for the walling and roofing is used throughout.

The stables, entrance-lodge, home farm, and terraces and gardens, are also being built, the whole laid out and planned so as to form an estate as compact and well arranged as possible. The site is on the slope of a hill, facing south, and overlooking the vale of the Dickler, with views stretching away to Oxfordshire. The builders are Messrs. Heyward & Wooster, of Bath, and the architect is Mr. E. Guy Dawber, of London.

FRIMLEY SANATORIUM.

THIS institution, which is the country branch of the Brompton Consumption Hospital, stands on a site of twenty acres, fronting the Bisley-road, over two miles from Frimley Station, in Surrey. It consists of sixteen buildings. The patients' block is cross-shaped, with accommodation for eighty-eight patients in four two-storied radial pavilions, and for twelve in the centre, where special cases may be under closer surveillance. Every patient's room faces south, south-south-east, or south-south-west. There are also dayrooms and disconnected sanitary towers, and office.

In addition to the two main staircases, there is a fire-escape staircase at the extremity of each pavilion; and, further, two of the pavilions are cut off from the other two by means of a corridor of fire-resisting construction, with a glass roof.

The shelter afforded by the recess will be used for reclining couches.

To the north of the main building are the assembly or recreation hall, the dining-rooms, and kitchen block. To the extreme east is the nurses' home, and to the other extreme the home for the medical men.

The roofs are of brown tiles, with tile-hung upper stories, and red brick walls beneath. Portland and Box ground stone are used for dressings.

The institution has its laundry, boiler and engine houses, laboratory, postmortem-room, mortuary, &c. It will be lighted by electricity

THE ENTRANCE FRONT

NETHER SWELL

for SIR JOHN MURRAY

E. GUY DAWBER

PHOTO-LITHO. SPRAGUE & Co LTD 44 & 5 EAST HARDING STREET, FETTER LANE, E.C.

Illustrations.

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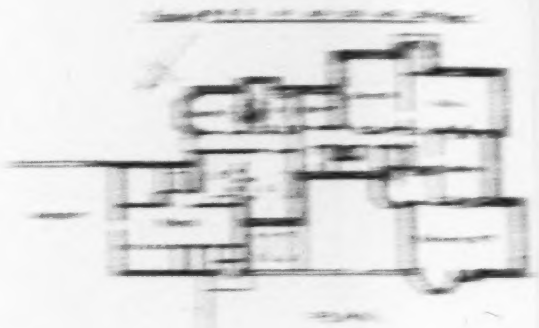
NETHER SWELL MANOR GLOS.
for SIR JOHN MURRAY SCOTT BART.
E GUY DAWBER ARCHITECT

THE ENTRANCE FRONT

PHOTO-LITHO. SPRAGUE & Co. Ltd. 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.



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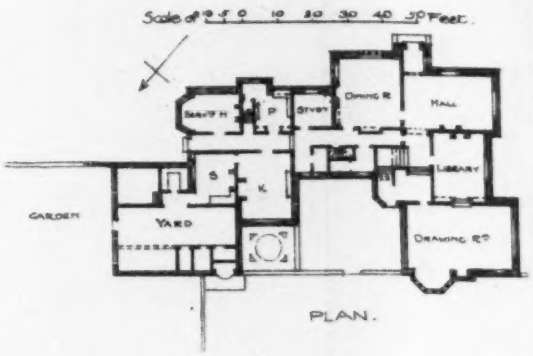


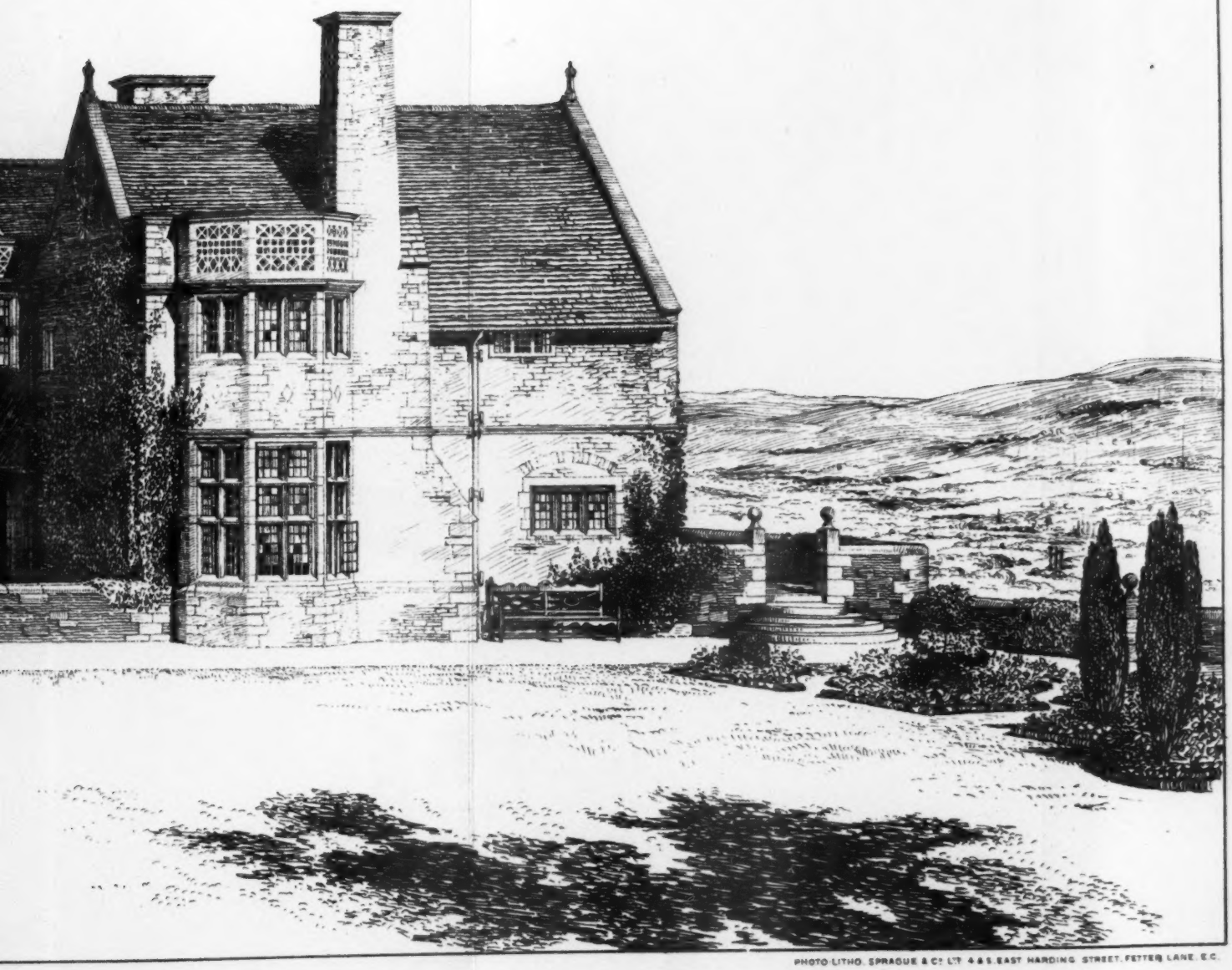
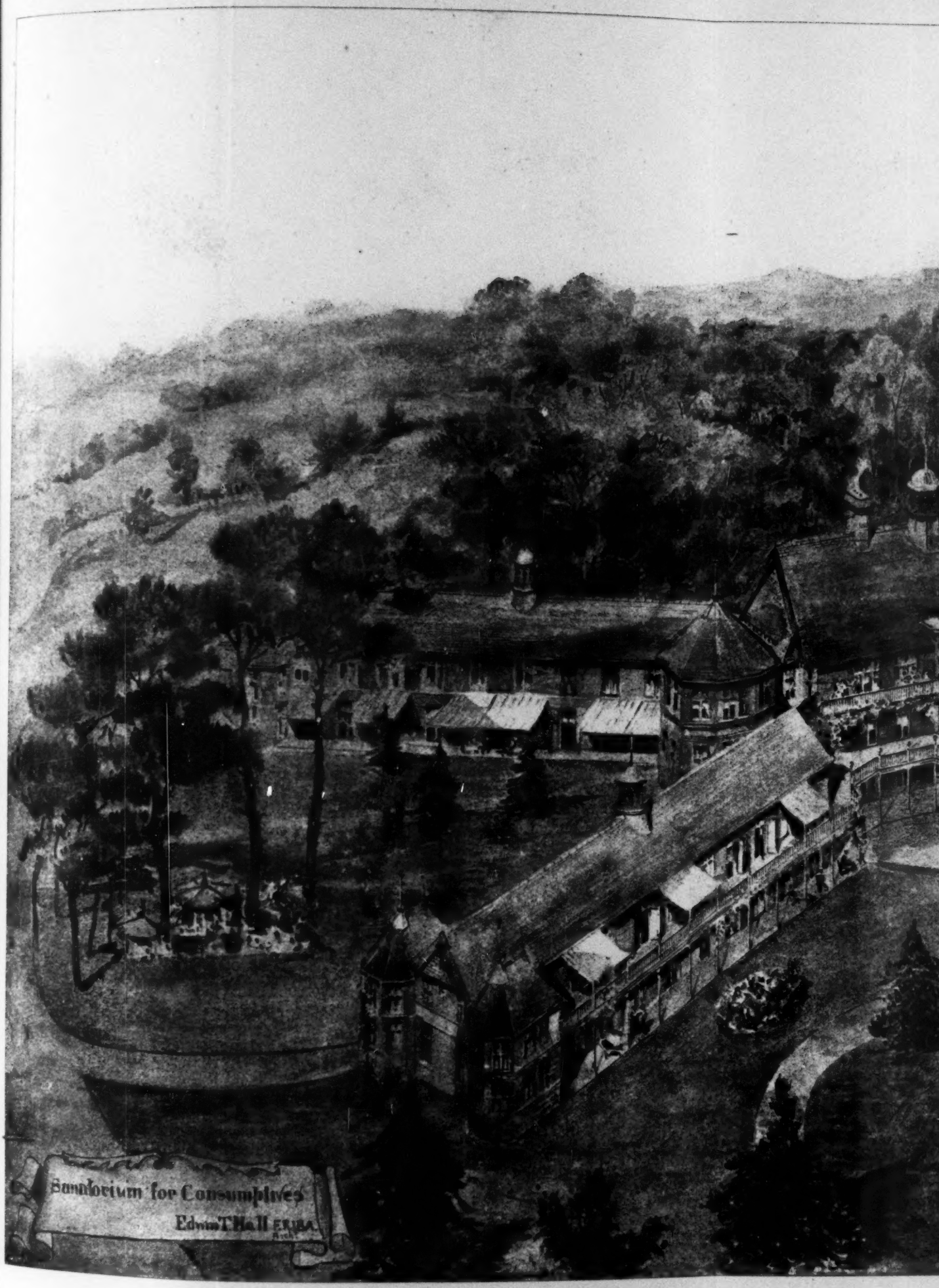


PHOTO-LITHO. SPRAGUE & Co. LTD. 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.


Sanatorium for Consumptives
Edwin T. Hall F.R.I.B.A.
Archt.

INK-PHOTO, SPRAGUE & Co LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

DESIGN FOR DRAWING-ROOM DECORATION (FREE BY

"INK-PHOTO" SPRAGUE & C° LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

(FREE BYZANTINE STYLE).—By Mr. T. Wallace Hay.

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generated on the premises, and electric motive power will be used in the laundry.

The general contractors are Messrs. Holliday & Greenwood, Ltd., of Brixton, S.W. The clerk of works is Mr. T. Chaney, and the architect Mr. Edwin T. Hall, of Bedford-square, W.C.

DESIGN FOR DECORATION OF A DRAWING-ROOM.

THIS design for a room decoration, by Mr. T. Wallace Hay, is based on a free treatment of Byzantine forms.

It is intended to be carried out with walls hung with crimson Venetian velvet, having embroidered borders and frieze in tones of old gold and deep brown; architraves of opening and door to be in carved onyx with mosaic panels on gold grounds; the door in ebony, with ivory inlay; the dado, soft deep-green wood tiles, with a rail border in gold mosaic ground, and a rich pattern in purple and blue; the coved panels having heraldic designs on gold mosaic grounds. The ceiling panels in decorated leather in colours, with stiles in inlaid boxwood, margins in sycamore, mahogany, and black lines and gold; furniture in olive wood.

BOOKS RECEIVED.

WALL PAPERS AND WALL COVERINGS. By Arthur S. Jennings. London: The Trade Papers Publishing Co., Ltd.

PATON'S LIST OF SCHOOLS AND TUTORS, 1903. Sixth Annual Edition. London: 143, Cannon-street, E.C. Price 1s. 6d.

REPORT ON THE HEALTH OF THE CITY OF LIVERPOOL DURING 1902. By E. W. Hope, M.D., Medical Officer of Health. Liverpool: C. Tinling & Co.

Correspondence.

THE ARCHITECTURAL ASSOCIATION.

SIR,—The Architectural Association has now acquired possession of the Royal Architectural Museum in Tufton-street, Westminster, and has obtained from the Ecclesiastical Commissioners a new lease for 999 years on most advantageous terms.

A contract with Messrs. Holloway Bros. for the necessary reconstruction to suit our requirements has been entered into, the amount of which is 8,440*l*. This expenditure is a considerable one, but the Committee has felt that it is bound to make adequate provision for future requirements.

Donations and promises have been received amounting to about 4,500*l*., leaving a balance of 5,000*l*. still required to meet the building contract, furnishing, and equipment.

In view of the importance of the work of the A.A. to the profession generally, I venture to appeal through your columns for further donations to assist us in meeting our liabilities. It is earnestly hoped that we may be able to enter our new premises free from debt.

HENRY T. HARE,
President.

The Student's Column.

CONCRETE-STEEL.—VII.

GENERAL THEORY—(*continued*).

ADHESION of the concrete to the steel, in spite of stresses caused by the load, or by variations of temperature, is a matter of prime importance, and without it the distinctive qualities of concrete-steel could not be realised. The high resistance of the combination is largely due to the fact that the constituent parts adhere so strongly one to the other that the action is that of a homogeneous structure. Adhesion enables the concrete to offer resistance against sliding along the surface of the steel, and thereby facilitates the transference of forces from one material to the other. The result is uniform behaviour somewhat akin to that obtained by the employment of iron or steel plates in the ordinary flitch-beam. Should the resistance to sliding fall below the required amount, the materials will act independently, and the resistance of the structure will be greatly reduced.

Equally important with the physical and mechanical adhesion of the concrete, are the disposition of the steel so that all stresses may

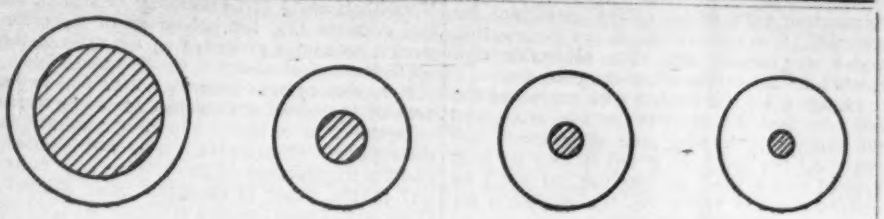

FIG. 9 FIG. 10 FIG. 11 FIG. 12

Illustrations to Student's Column.

be properly resisted, and the sub-division of the steel so that its influence may extend to all parts of the concrete.

The correct function of the steel is to ensure the thorough distribution of strain in every part of the concrete in which it is embedded, thus preventing the concentration of strain and consequent rupture at any point where there may be an element of weakness. In the case of a beam, the steel has chiefly to resist tensile stress, and if it is applied in large units—such as bars of T or I section—it will be impossible to attain the required result. Here we find the line of demarcation between ordinary "steel and concrete" construction, and concrete-steel construction. In the former, the steel beams and joists constitute the main source of strength, supporting the applied load and the weight of the concrete, receiving little or no aid from the concrete, and imparting no new qualities to that material. In the latter, the steel reinforcement is not expected to do more than half the work, as the concrete takes care of compressive stress. Further, it is known that the concrete actually resists part of the tensile stress, thus reducing still further the duty of the steel. At the same time, the steel increases the original resistance and elasticity of the concrete.

The exact disposition of the steel must be settled in each case in accordance with the distribution of stress, which can be ascertained by the usual analytical or graphical methods. With regard to subdivision of the steel, we may say that if absolute compliance with theory were practicable, the proper course for adoption would be to employ steel wire of the smallest possible gauge, distributed so that numberless hair-like filaments of metal might be present in every square inch of the concrete, for picking up and transmitting stress. Of course, ideal methods are not suited to the exigencies of every-day work, but in concrete-steel, as in other construction, the best results are always obtained when practice most faithfully represents theoretical principles. Hence, the most successful designers of concrete-steel structures are those who make use of reinforcement in finely-divided forms, and apply it so that the stresses encountered may be adequately met.

For the purpose of obtaining a clear conception of concrete-steel, the elastic properties of the constituents must be considered. The correct proportion of steel to concrete is directly contingent upon the ratio between the coefficients of elasticity of the two materials, and the whole theory of concrete-steel is dependent upon recognition of the values of these coefficients.

The modulus of elasticity represents the reciprocal of the extension or compression per unit stress and unit length. It represents the force that would, if such a thing were possible, stretch a bar of any material to double the original length, or compress it to half the original length. Thus, the statement that the value of E for steel is 30,000,000 lbs. per sq. in. implies that a force of 1 lb. would stretch or compress a bar of 1-in. area by $\frac{1}{30000000}$, or $0{\cdot}00000003\dot{3}$ of its original length. Similarly, if the value of E for concrete is 3,000,000 lbs. per sq. in., a force of 1 lb. corresponds with an extension or compression of $\frac{1}{3000000}$, or $0{\cdot}0000003\dot{3}$ of the original length of the bar. Therefore the application of tensile force of any given intensity to a unit area of concrete will be followed by an extension ten times the length of the extension caused by the application of an equal force to a unit area of steel. Hence, for an equal elongation, the steel will carry ten times the stress carried by concrete.

Further, it should be remembered that the greater the value of E, the less will be the extension or compression for a given stress, and that the smaller the value of E, the greater will be the extension or compression for a given stress.

We now see the importance of knowing in every case what are the actual values of the coefficients of elasticity for the materials to be used in concrete-steel. As evidenced by the tables previously given, the value of E for steel is a fairly constant quantity, but the value of E for concrete is extremely variable. The value varies with the proportions and materials adopted in making the concrete, and with the increase of unit stress. Tables may be used for the purpose of arriving at averages for ordinary work, but for important structures it is to be recommended that the elastic properties of the concrete should be specially determined.

Suitable allowance should always be made to compensate for the decrease of E with increase of unit stress. It is also necessary to decide the question whether calculations should be based upon the coefficient E, corresponding with total deformation, or upon the coefficient E_1, corresponding with purely elastic deformation. Assuming the bond between the concrete and the steel to be perfect the deformation of both materials must be equal, and all permanent deformation or "set" must, similarly, be equal. But permanent deformation is greater in the case of concrete than in that of steel. Hence, on the removal of load, the elastic contraction of the steel induces tensile stress in the steel and compressive stress in the concrete; and the reimposition of load causes stresses which are additional to the previously-created internal stresses. For these reasons, it appears that the coefficient of pure elasticity is of less service to the designer than the coefficient E calculated from total deformation.

When the relationship between the coefficients of elasticity was first considered in connexion with concrete-steel, the value of E for concrete was assumed to be about 710,000 lbs. per square inch, which is about one-fortieth the value of E for steel. Using the symbol r to represent the ratio of one coefficient to the other, we have in this case $r=40$. Subsequently the opinion was formed that the value of E for concrete was 1,400,000 lbs., giving $r=20$; and more recently the value of E for 1 : 2 : 4 and 1 : 3 : 5 concrete has been shown to be from 2,800,000 lbs. to 3,500,000 lbs., so that $r=10$ is an expression very generally used to indicate the relationship between the coefficients of elasticity for steel and concrete.

During the period when knowledge on the subject of concrete-steel was being acquired, the values for E for both steel and concrete really remained constant, and were in no way altered by the changing views of investigators. Consequently, structures designed upon the theoretical basis, $r=40$, really embodied the basis, $r=10$. Therefore in such cases the concrete was able to take, and actually did take, a greater share of the duty than was intended or known by the designers. The inference is that an excessive proportion of steel was used in former years.

One or two simple calculations will serve to make these points clear, and to indicate the importance of properly taking account of the values of E, in concrete steel design.

With the object of avoiding unnecessary fractions we will take the value of E for steel at 30,000,000 lbs. per sq. in., with a corresponding extension of $0{\cdot}00000003\dot{3}$ per lb., and in each case we will consider a unit length of 1 in. so that extensions shall represent fractions of an inch. We will take three values for the ratio between the values of the coefficients of elasticity, viz.—$r=40$, $r=20$, and $r=10$, cor-

responding with values of the coefficient for concrete, E = 750,000 lbs., E = 1,500,000 lbs., and E = 3,000,000 lbs. The allowable unit stress for steel will be taken at 15,000 lbs.

In fig. 9 let the shaded area represent the cross section of a steel bar of 1-in. area; and the outer ring a 1-in. area of concrete surrounding the steel. If a direct pull be now applied to the steel, so that the bar shall be under a stress of 15,000 lbs., the extension for a unit length will be $15{,}000 \times 0{\cdot}000000033 = 0{\cdot}0005$-in. The stress equivalent to an equal extension of the concrete will vary with the ratio of the coefficients of elasticity, and assuming stress to be strictly proportionate to strain, the results are :—

	Stress in concrete.
If $r = 40$ $(0{\cdot}0005 \times 750{,}000) =$	375 lbs. per sq. in.
„ $r = 20$ $(0{\cdot}0005 \times 1{,}500{,}000) =$	750 „ „
„ $r = 10$ $(0{\cdot}0005 \times 3{,}000{,}000) =$	1,500 „ „

We will now look at the matter from a different point of view, assuming the direct pull on the steel to be such that the stress in that material shall be only 50 lbs. The elongation of the concrete, varying with the value of the coefficient of elasticity, will be $(0{\cdot}000000133 \times 50) = 0{\cdot}000066$ for $r = 40$; $(0{\cdot}00000066 \times 50) = 0{\cdot}000033$ for $r = 20$; and $(0{\cdot}00000033 \times 50) = 0{\cdot}0000166$ for $r = 10$.

For equal extensions of the steel in tension the stresses will be as follows :—

	Stress in Steel.
$r = 40$ $(0{\cdot}000066 \times 30{,}000{,}000) =$	2,000 lbs.
$r = 20$ $(0{\cdot}000033 \times 30{,}000{,}000) =$	1,000 „
$r = 10$ $(0{\cdot}0000166 \times 30{,}000{,}000) =$	500 „

Comparing the above results, we find in the first set of figures that the equivalent stress in the concrete is abnormally high for ordinary concrete, and in the second set of figures that the stress in the steel is ridiculously low, and the work left for the steel decreases with the increase of the value of E for concrete. In each case the whole of the concrete is fairly within the sphere of influence of the steel, and, assuming the bond to be perfect, the elongation of the concrete must be equal to the elongation of the steel.

We will now see how the materials may be used to better advantage. As Hooke's law of the proportionality between stress and strain does not hold good for concrete, the elongation of 0·0005 in. would not involve stress to the extent shown in the first set of figures, and recent investigation has shown that the concrete should be capable of proportionate distortion of twenty times that at which simple concrete would fail in tension. Consequently the proportion of steel can be reduced, as shown in figs. 10, 11, and 12, to $\frac{3}{16}$ sq. in., $\frac{1}{16}$ sq. in., and $\frac{1}{36}$ sq. in., according to the values, $r = 40$, $r = 20$, and $r = 10$, thereby raising the stresses in the second set of figures to 15,000 lbs. per square inch, without involving failure of the concrete.

The foregoing figures are based upon the assumption that a direct pull is applied to the steel, and that the bond is theoretically perfect. Consequently, tensile stress is only communicated to the concrete through the steel, and we may say that the elongation of the concrete is directly caused by the elongation of the steel. In a beam the state of things is different. Tensile stress is then distributed over the area below the neutral axis in accordance with the laws governing flexure in beams. If no reinforcement be present, the whole of the stress will fall upon the concrete, the elongation of which will then be governed by the value of the coefficient E. If reinforcement be present, the tensile stress will still come upon the concrete, being transferred in part to the steel. In the latter event, as steel elongates less than concrete for a given stress, and if the bond be perfect, the concrete will only be permitted to elongate to the same extent as the steel. The proportion of the total stress carried by the concrete will depend upon the proportion of steel to concrete. If the area of steel be proportionately great, most of the stress will be taken up by the steel; and if the area of steel be proportionately small, most of the stress will remain to be resisted by the concrete.

Therefore, we see that in the case of a simple pull applied to the steel, tensile stress is transferred to the concrete from the steel; while in the case of flexure, tensile stress is transferred from the concrete to the steel, or comes simultaneously upon the two materials. Notwithstanding this difference of action, the fact remains that the behaviour of concrete-steel is invariably governed by the ratio of the coefficients of elasticity of the two materials.

It is also evident from figs. 9-12 that as the area of the steel diminishes in comparison with the area of the surrounding concrete, so the sphere of influence of the steel diminishes, and the transference of strain from one material to the other is rendered more difficult. Close to the steel the two materials will act in unison, but as the distance increases, there will be a tendency for the concrete to act independently, because the reinforcing effect of the steel varies inversely as the square of the distance. If the steel be concentrated in the form of a single bar, it is certain that strain must be unequally distributed in the concrete, so that its ultimate strength may be reached in remote parts, while stress in the immediate neighbourhood of the steel may be well within permissible limits.

GENERAL BUILDING NEWS.

Church Additions, Priorslee, Salop.—The foundation-stone of a new chancel to Priorslee Church, Salop, has just been laid. Plans were prepared by Mr. C. R. Dalgleish, architect, Wellington, for the work, the estimated cost of which is 399*l.*, and the contract was let to Mr. J. T. Hayes of Shrewsbury. The new chancel will be 25 ft. by 20 ft., and the style will be in harmony with that of the old part of the church. On the north and south sides will be placed two lancet windows. There will be a new traceried east window of triple lights, surmounted by a circular ornamental light.

Primitive Methodist Church Buildings, Hirst, Northumberland.—The foundation-stones of new church buildings, which are to be erected by the Hirst Primitive Methodist Society, were recently laid at Hirst. The church, when finished, will provide seating accommodation for 750 persons. The scheme also includes the erection of new Sunday schools, the total cost being estimated at 2,500*l.* The buildings were designed by Mr. T. Tulip, of Choppington, Messrs. Gordon, of Stakeford, being the contractors.

Church of St. Columba, Drumcondra, Dublin.—The foundation-stone of the new church of St. Columba, Drumcondra, was laid on the 7th inst. The new church will occupy a site at the top of St. Alphonsus-road, Drumcondra. It is in the Romanesque style, and the plans provide for a nave and aisles, north and south transepts, chancel and side chapels, and a tower flanking the north side of the west front. The nave is 30 ft. wide in the clear, and 100 ft. long to the crossing, divided in six bays with stone quatrefoil columns with moulded caps, and annulets embellished with Celtic ornamentation. The arches and hood moulds are also in stone, enriched with chevron ornament, while blocks are left on the hood moulds for the carved heads of Irish saints. The height of the nave to the ceiling is 54 ft., and is lighted by an arcade of semicircular-headed windows in the clearstory, with moulded hood moulds and jambs, filled with lead-light glazing. The end bay adjoining the west front is devoted to the organ gallery, the front of which will be divided into three bays with polished granite columns and stone arches, carved and ornamented, the balustrade being arranged with moulded semicircular arches and small, polished columns. Access to the organ gallery is obtained through the circular turret flanking the front on the south side. Underneath the organ gallery provision is made for the nave entrance porch, which is panelled and framed in pitch pine, with lead-light glazing. The aisles are 15 ft. wide in the clear. The total length of the church, including the chancel, is 162 ft., but the present contract only includes the nave and transepts, the total length of which will be 128 ft., the width across transepts being 101 ft. The walls will all be built with coursed granite, with brick lining internally, the foundations being in cement concrete. The dressings of the windows and doors, externally, will be in white limestone. The church is being built by Messrs. W. Conolly & Son, from the designs, and under the supervision, of Messrs. Ashlin & Coleman, architects, Dublin. Mr. J. P. Cox is acting as foreman.—*Freeman's Journal.*

Bluecoat Hospital, Wavertree, Liverpool.—The new buildings of the Liverpool Bluecoat Hospital, the foundation-stone of which was laid on the 5th inst. at Wavertree, have been designed by Messrs. Briggs & Wolstenholme and Messrs. F. B. Hobbs & A. Thornely. Seven and a half acres of land, situate on the south side of Wavertree Parish Church, comprise the site, of which five acres will be occupied by the buildings. The remainder is reserved as a playing-field. On the east side the site is bounded by Church-road, and in this thoroughfare will be the principal entrance. The gate, with a lodge on each side, gives access to a short drive, conducting to the main doorway, situated in a tower which is to form the central feature of the east façade. When completed, the tower will be 125 ft. in height; it is to be furnished with a clock and bells. The aspect of the hospital from this point is that of a one-story building, with the tower in the centre, and at one end the chapel, and at the other a gymnasium and swimming-bath. The base of the tower forms a vestibule 17 ft. square, from which open on one side the boardroom, and the other the office. In front, facing the outer door, is the entrance to a corridor 9 ft. wide, extending from the chapel to the gymnasium, and lighted from the interior quadrangles. From this corridor, turning to the left, there is access to the headmaster's apartments, which adjoin the office; and, turning to the right, the access to an applicants' waiting-room (with separate street entrance), medical examination-rooms, &c., these communicating with the boardroom. At right angles to this first corridor, and right in line with the entrance, is the main corridor, 14 ft. wide, which leads to the central hall, 100 ft. by 47 ft. and 30 ft. in height. The hall, lighted by windows on both sides, will seat 616 persons. It is intended for school celebrations, lectures, and entertainments. The adjuncts include platform, retiring-rooms, a bandroom, &c. Beneath the central hall is the dining-hall, 18 ft. high, and of the same dimensions. On the north side of the central hall is the main staff quadrangle, and on the south side the female staff quadrangle, each 196 ft. by 69 ft. They will be laid out as lawns. The main block is beyond the central hall, and at right angles to it, and faces west, with an outlook over Wavertree Playground. Owing to the fall of the land, the buildings on this side are three stories high. The main block will be flanked by wings extending 70 ft. beyond the west main front. The buildings, therefore, will enclose on three sides the boys' playground, 782 ft. by 76 ft. On the fourth side of the quadrangle will be a cloister. The lower story of the central building and wings will be used altogether for classrooms, recreation-rooms, the two upper floors for dormitories, and apartments of masters and mistresses. The accommodation is for 250 boys and 150 girls. The kitchens and offices are placed on the east side of the female quadrangle. The chapel, circular in form, with four bays like the arms of a cross, will seat 600 worshippers. The entrance on the north faces the organ in the bay to the south. Like the existing hospital in School-lane, the buildings are designed in the Late Renaissance style. They will be of red brick, faced with white stone. The estimated cost is 65,000*l.*

Hotel, South Shields.—The first portion of a scheme of extension in connexion with the Golden Lion Hotel, King-street, South Shields, has been completed. In the old building the number of bedrooms was fourteen, but this has now been augmented to fifty, with bathrooms. In North-street a new entrance, with a glass canopy roof over the pavement, has been provided, and from this point a corridor runs the whole length of the building. The accommodation includes a new smokeroom or sitting-room, a restaurant, a billiard-room, and a stockroom. Over the restaurant and smokeroom, on the first floor, is a banqueting and assembly hall, which will be known as the "King's Hall." It is over 60 ft. long by 32 ft. wide, and will seat 300 people. The hall is approached by a separate staircase, and, on the landing, retiring rooms are provided; while to the left of the banqueting hall is a reception hall. The kitchen and scullery are situated over the stock and service rooms. On the two floors above the extra bedrooms have been provided. The existing hotel entrance in the King-street section has been improved and the main staircase altered. The flooring of the staircase and hall has been laid with terrazzo, and the space furnished with an office for the hotel bookkeeper. The entire work has been executed from plans prepared by Mr. J. H. Morton, architect, South Shields. The building has been erected by Mr. R. Allison, Whitburn; while the rest of the work has been done by the following:—Mr. John Taylor, tiling; Mr. Hugh Niven, plastering; Messrs. Dinning & Cooke, Newcastle, heating and cooking apparatus; Mr. G. T. Grey, ironwork; Mr. W. Allon, decorating; and Mr. J. T. Dagleis, plumbing and electric lighting.

Club Buildings, Blyth.—The new premises of Blyth and District Social Club and Workmen's Institute were opened on Bank Holiday (Monday). The buildings, which occupy a freehold site in Station-street and Keelman's-terrace, Cowpen Quay, have been erected from plans prepared by Mr. John Goulding, of Blyth, and the estimated cost is 7,000*l.* They provide on the ground floor a bar-room, a large parlour, and two smaller rooms, together with four bathrooms and the necessary adjuncts. The space on the first floor is largely utilised in providing a billiard department fitted up with three full-sized tables and the usual accessories. Adjoining, there are a refreshment bar and games-room; and near the stairhead is the directors' room. On the second floor there is a hall, to which access may be gained by a separate entrance. The news-room and library are also situated on this floor.

Drill Hall, Chatham.—Lord Roberts laid the foundation-stone recently of a new drill hall and headquarters at Fort Pitt Fields, Chatham. The building will be of ferro concrete. The drill hall itself will be 120 ft. by 70 ft., and attached there will be an armoury, Colonel's and Adjutant's rooms, orderly-rooms, quartermaster's stores, bandroom, and rooms for officers, non-commissioned officers, and men. There will also be quarters for the resident staff, and provision made in the basement for ambulance waggon and machine guns. The total

cost is estimated at 6,500*l*. Mr. G. H. Wells, of Chatham, is the architect.

POST OFFICE, SUNDERLAND.—The new Post Office at Sunderland has just been opened. The site occupied by the buildings, which serve both the Post Office and the Inland Revenue, is a portion of the old "Shrubbery" in West Sunniside. The remaining vacant plots are laid out as ornamental gardens. The site measures 270 ft. by 63 ft. The plans were by Mr. Henry Tanner, of London; the style is Renaissance. The contract was let to a local builder, Mr. J. W. White, and the construction was supervised by Mr. E. J. Searchfield, of H.M. Office of Works.

ST. MARY'S SCHOOL, CLELAND, LANARKSHIRE.—This new building has just been completed. There are two floors—that on the ground level being devoted to classrooms, while the upper floor is a large hall for drill and recreation, it being ultimately intended to divide part of it into additional classrooms by movable partitions. The school, the architect of which is Mr. W. Brenan, of Glasgow, has accommodation for about 350 children and 350 more if the hall upstairs is utilised.

BAPTIST SUNDAY SCHOOLS, PAIGNTON.—The memorial-stones of the new Baptist Sunday schools, to be erected in Winner-street, Paignton, were laid recently. Messrs. Bridgman & Bridgman are the architects, the builder being Mr. R. Harris.

CORPORATION BATHS, BRISTOL.—New baths have been constructed at Barton Hill by the Bristol Corporation. The swimming bath tank is 75 ft. by 30 ft., the water being 3 ft. 6 in. deep at one end and 6 ft. 0 in. deep at the other. The gangways are 10 ft. wide excepting at one end, which is 8 ft. The tank is lined with white glazed brickwork with white glazed scum-trough. There are special blocks indicating the depths of the water at the various points, and the depths are also indicated on the posts of dressing-boxes. The floors of the gangways are of terrazzo with sandstone kerb, &c. A shower bath and foot bath are also provided. The dressing-boxes (of which there are forty-three) are made to fall back against the wall, leaving the gangways free when special aquatic entertainments are given, or when the swimming-bath is being used as a public hall. The main walls are lined with glazed bricks to a height of 7 ft., and finished above with Keene's cement and roofed with steel principals, boarded and having lantern light, provision being made for fixing gymnastic appliances. A gallery for spectators is provided over the dressing-boxes, giving about 280 seats, and having proper entrances and exits. In the winter time the swimming bath will be converted into a public hall by flooring over the plunge bath at gangway level, folding back dressing-boxes, removing the chute, diving stage, spring board, &c., and providing a platform for speakers, lecturers, &c. The heating arrangements will also be altered to suit the changed use. Separate entrances, ticket offices, exit, and retiring-rooms are provided, giving ample facilities both for the public and the performers. The hall will be available for concerts, lectures, public meetings, and the like during the winter months. The slipper baths are grouped into compartments formed by glazed brick walls 7 ft. high, finished above with painted Keene's cement, with open timber roofs having lantern lights, and floored with terrazzo paving. Each bath is placed in a separate cubicle, 6 ft. by 6 ft., formed with enamelled slate, and fitted with electric bell, time indicator, floor flushing pipe, &c. The water supply is arranged with valves in such a manner as not to throw more than four baths out of use when repairs are required. There are ten slipper baths for women, six first-class and eighteen second-class baths for men, besides two in Kane's baths. The plans of Kane's Baths illustrate a method of constructing bath compartments so that the bath-room is separated from the dressing-room, whether slipper or spray baths are the cleansing medium employed. The author of the system believes that it is absolutely essential that the bathing compartment should be maintained at a considerably higher temperature than the dressing compartment, both as a means of more thoroughly cleansing the body and as a preventative of chills to the bather. The system consists of a specially-designed central bath-room, in which are placed the bath compartments, fitted with slipper, spray, shower, and needle baths, or a combination of each, and a suitably-designed system of dressing-rooms. The dressing-rooms are arranged on either side of the bathroom, but they might have been grouped in a separate room, which might or might not have been on the same floor level. The dressing-rooms are arranged on either side of the bathroom. The bathing compartments are grouped in pairs along the centre of the bathroom, with a corridor on each side. Opposite to the entrance to each compartment on either side is a door in the wall, which communicates with the dressing-room. Each dressing-room has, therefore, two doors, one communicating with the outer corridor by which the bather enters the dressing-room from the main entrance, the other communicating with the bathroom, and directly opposite to the corresponding bathing compartment. Ample fresh, warm, dry air is delivered to each bathroom at 110 degrees, and to each dressing-room at 65 deg. Fahrenheit. The blower, with the steam heater in the chamber below, is driven by electric motor, which can be worked by the attendant above. Extract gratings and flues are provided in the adjoining walls capable of adjustment to suit any conditions. The engineering work in the buildings has been carried out by Messrs. Thomas Bradford & Co., of London. The building is lighted throughout by electricity, all the wiring and lights being in watertight tubes and fittings. The general contractor is Mr. A. J. Beaven, of Bristol. The sketch-plans for the establishment were designed by the City Engineer and approved by the Local Government Board. The working-drawings, specifications, and superintendence of the erection of the buildings and engineering contract have been undertaken by Mr. W. S. Skinner, architect, of Bristol; and Mr. James Hurn has acted as clerk of the works. The amount of contract for the building work is 13,680*l*., and for engineering close on 3,000*l*. —*Bristol Mercury*.

GORDON BOYS' MEMORIAL HOME, NOTTINGHAM.—The memorial stone of the new permanent premises for the Nottingham Gordon Memorial Home for Destitute Boys was laid recently. The premises have been designed to accommodate seventy-two boys, compared with forty in the existing building in Peel-street. Mr. E. R. Sutton, of Nottingham, is the architect.

VICTORIA HALL, SUNDERLAND.—The Victoria Hall, Sunderland, the scene of the catastrophe of 1883, is about to undergo remodelling and enlargement. The architect is Mr. John Ettringham, of Sunderland, whose designs were accepted in competition.

NEW BUILDINGS, HASTINGS.—The Roads Committee of Hasting's Town Council have just recommended approval of plans for new buildings as follows:—Alterations to school premises, Archery-road, Mr. P. Jenkins, builder, per Mr. A. Reeve, architect; two houses, Downs-road, per Messrs. Cooper & Coussens, architects; new flats, Mount Pleasant-road, Mr. J. Hayhurst, per Messrs. Cooper & Coussens, architects; additions at rear of No. 17, Mount Pleasant-road, Mr. R. Reeks, per Mr. A. Dray, architect; alterations and additions, Eversfield Hotel, and 22, Eversfield-place, directors of the Eversfield Hotel, per Mr. P. Tree, architect; temporary workshops, Downs-road, Mr. E. W. Hodge, per Messrs. Cooper & Coussens, architects; alterations forming opening in party wall, 11 and 12, Eversfield-place, Mr. P. Tree, architect; new laundry premises, Brickfield Ridge, Old London-road, Mr. H. Martin, per Mr. T. King, architect; new buildings, upper part of Edward-road, Hollington, Mr. S. Roberts, per Mr. T. King, architect.

NORFOLK MARKET HALL, SHEFFIELD.—The Sheffield Market Committee have passed the following resolution for adoption by the City Council:—"That the tender of Messrs. John Eshelby & Son, of Sheffield, for the rebuilding of the Haymarket front of the Norfolk Market Hall, according to plans and specifications prepared by Messrs. Holmes & Watson, for the sum of 8,850*l*., be accepted, and that the corporate common seal be affixed to the necessary contract."

PUBLIC LIBRARY, INNERLEITHEN, N.B.—A new public library is to be erected at Innerleithen, from the designs, selected in competition, of Mr. Peter L. Henderson, Edinburgh. The building is two stories in height, with lending library, reading-room, and committee-room on the ground floor, and a lecture-hall and librarian's house on the upper floor. The cost is not expected to exceed 2,000*l*.

EXTENSIONS TO NORFOLK COUNTY ASYLUM.—The enlargements and alterations in connexion with the Norfolk County Asylum are now nearing completion. The scheme adds another 150 beds to the accommodation, and the total cost of the improvements amounts to 70,000*l*., but probably half of this sum has been spent on the reorganisation of the engineering department, the electric lighting, warming, &c. The general contractors for the work are Messrs. King, of Norwich. Messrs. Haydon, of Trowbridge, Wiltshire, supplied the engines; Messrs. Reavell put in the electric light machinery; Messrs. Lawrence, Scott, & Co., of Norwich, are responsible for the dynamos; and Messrs. Mann, of Norwich, for the wiring. The alterations have been carried out from the plans of Mr. A. J. Woods, architect, of London.

BRITISH MUSEUM EXTENSION.—Plans for a new wing of the British Museum were on view on the 10th inst., in the Tea-room at the House of Commons. They were shown in connexion with the grant which Parliament is making for the extension. The cost will be about 200,000*l*. The present addition, says the *Daily Chronicle*, is part of a general scheme which will ultimately see the British Museum covering the whole area bounded by Great Russell-street, Montague-street, Montague-place, and Bedford-square. The ground forming this block and not already occupied by the Museum buildings was acquired some time ago from the Duke of Bedford. An important step in its utilisation is represented by the plans which Mr. Henry Tanner, the Architect of the Office of Works, has just completed. They concern the frontage towards Montague-place, or the northern side of the Museum. Here a fine block 380 ft. long will be erected. This length does not cover the whole frontage towards Montague-place. Corner wings, as they may be called, like the White Wing, which was built twenty years ago to the south-east of the main building, will some day be added. The design of the new block is in harmony with the general scheme of the Museum. The new building, when it has been erected, will be utilised in connexion with the Museum library and exhibition galleries. It is to be of five stories. There will be a basement devoted to storage, and then a sub-ground floor, which will be utilised for storage, and also as receiving and packing rooms. Next will come a ground floor of galleries, and over it a mezzanine floor with a variety of rooms for general purposes and the use of students. Lastly, there will be an upper floor, which will consist of galleries and further working space for students.

SANITARY AND ENGINEERING NEWS.

NEW WATER SUPPLY, MARGATE.—The question of a better water supply to Margate has pressed heavily on the Corporation for many years past. The original pumping works are situated at the Tivoli, and, to meet the requirements of the growing population, the Dane Works were constructed in 1886. These works have been the means of averting the complete breakdown of the water supply for some years, but the carrying out of the main drainage scheme in 1888-90, and the consequent great impetus to building operations, caused a much greater demand for water, which the combined works were unable to meet. In 1895 Mr. Mansergh, C.E., was called in to advise the Corporation, and the following year he made a report, recommending that a new supply should be taken from the surface-water stream running from Wingham. For several reasons this scheme fell through, and in 1898-99 the Corporation put down an experimental deep bore-hole in the Dane, penetrating the lower green sand, at a cost of 1,476*l*., but the water was found to be too brackish for domestic use, and therefore the work had to be abandoned. In the year 1900 the Corporation promoted a Bill in Parliament to procure water from Brooke's End—Mr. Baldwin Latham, C.E., being the Engineer—but which failed to obtain Parliamentary sanction. In 1901 the Corporation put down a supplementary salt-water scheme at a cost of 3,225*l*., and the same year experimented further in trying to obtain water from Nash Court, at a cost of 975*l*., which experiment also failed to supply any appreciable amount of water. The scheme which was finally adopted received Parliamentary sanction last year, and is now carried out: it was propounded by Mr. Albert Latham, M.Inst.C.E., the Borough Engineer. The site of the works is on the mainland at Uffington, in the parish of Wingham, near the outcrop of the line of chalk hills ranging from Canterbury to Dover. The scheme includes the sinking of the pumping well and adits driven in the chalk to a length of 3,000 yards, at the level of ordnance datum, which is 132 ft. below the surface at the pumping station, the site of which is at least a mile from the nearest house in the village of Wingham. On this site, which is 6 acres in extent, have been erected engine and boiler houses, workshops, storehouses, coal-shed, weighbridge, a block of cottages for the staff, engineer's house, board room, workmen's bath, stable, coach-houses, &c. It was estimated that 2,000,000 gallons of water per diem could be obtained from these works as the water line stood at 33 ft. above O.D., rising to 156 ft. above O.D. at Womenswold, about four miles to the south, there being an area of fifteen square miles to draw upon. It has been found that this estimate was very much too low, it being now evident that there is sufficient water to be obtained here to supply the whole of the Isle of Thanet. One-third only of the length of adits has been driven, which length yields over 2,500,000 gallons per diem, or more than double the present requirements of the town, which quantity can be increased to 5,000,000 or 6,000,000 gallons, if required, in the future. To construct this length of 1,000 yards, it has been necessary to pump about 503,000,000 gallons of water to waste, which is more than the total quantity of water supplied from both pumping stations in Margate for the last two years. To show the recovering power of the wells on the cessation of the pumping, the water line rose in a few days to within 4 ft. of its original level. The water is delivered into the town by means of an 18 in. cast-iron main, fourteen miles in length, through which the water is pumped from the well by two duplicate triple expansion engines and pumps of 166 horse-power each; each pump at its normal speed will deliver 2,000,000 gallons of water in the twenty-four hours, or 1,000,000 gallons in the twelve hours, but they are both capable of working at a much greater speed. The 18 in. main was designed to pass 1,000,000 gallons of water in the twelve hours, but such care has been taken in the laying and such easy curves have been introduced that, in consequence, the estimated friction has been reduced, so that the main will readily deliver a much greater quantity of water per diem. This also carries with it a reduction in the amount of coal consumed. The Parliamentary estimate, including the rising main, buildings, engines and pumps, well and adits, with 10 per cent. added for contingencies, amounted to 83,985*l*., whereas the contracts entered into by the Council for carrying out this work amounted to 70,750*l*. In connexion with this scheme the Corporation of Margate have extended their water district, so as to include about seventeen parishes in east Kent, covering an area of about fifty square miles. They have already the work for supplying this district well in hand. Two supplementary

pumps have been erected at the works and also a reservoir completed at Uffington and a high level tank at Woodlands, three miles distant on the high ground, the top water line of which is 332 ft. above ordnance datum and the level of the floor of the adits at Uffington. One of the contracts for the mains comprises over fourteen miles of main, of which ten miles have been completed. Before the scheme was finally adopted by the Corporation they took the opinion of Messrs. Hawkesley & Eaton and Mr. Whittaker, the geologist, who reported that "they considered the scheme would afford a good and ample supply of water, admirable in quality and sufficient in quantity to meet the growing demands of Margate for many years to come."

Water Supply, the Rosyth Naval Base.—The principal business before a meeting of Dunfermline District Committee, held at Dunfermline on the 4th inst., was the question of the introduction of a new water supply into the district, including the Rosyth naval base. A Report by the Water Supplies Committee proposed that the Glenquey burn, in the Glendevon district, should be harnessed, and that an 18-in. pipe should be laid from a reservoir at the burn to a point near Dunfermline, and that from there a 12-inch pipe be put down to Castlandhill, near the naval base. It was estimated that the cost of the works would be from 100,000*l.* to 120,000*l.*

MISCELLANEOUS.

Professional and Business Announcement.—Messrs. Knight & Parkinson, of Temple Chambers, E.C., architects and surveyors, have dissolved partnership. Mr. Samuel Knight, F.R.I.B.A., will continue to practise at the above address, and Mr. C. E. L. Parkinson, A.R.I.B.A., will practise at 44, Bedford-row, W.C.

New Park, Tottenham.—Mr. L. E. Ward, Chairman of the Tottenham District Council, on the 6th inst. opened Downhills Park—twenty-six acres of land in the centre of the district. The new park has been acquired at a cost of 31,150*l.*, of which sum the Middlesex County Council contributed 5,300*l.* It adjoins the estate which the London County Council will use for building dwellings for 40,000 persons. Previous to declaring the park open Mr. Ward laid the foundation-stone of a dust destructor, which will cost 27,000*l.*

Workmen's Dwellings at Rotherham.—The committee of the Council of the County Borough of Rotherham have considered plans, report, and estimate prepared by the Corporation architect in regard to workmen's dwellings. Class A house will have accommodation:—Ground floor: sitting-room, with projecting window; kitchen; small scullery, with bath in niche opening into scullery; pantry. First floor, two bedrooms; attic floor, one bedroom; separate yards. Cost, 190*l.* per house. Class C accommodation:—Ground floor, living-room, kitchen, lobby and pantry; first floor, two bedrooms and closet; attic, one bedroom; separate yards. Cost, 150*l.* per house. The estimated cost of twenty-five houses Class A is 4,750*l.*; of thirty-five houses Class C, 5,250*l*; total 10,927*l.* Adding cost of land, roads, and drainage, the amount is brought to 11,627*l.* The total annual charge to pay interest and sinking fund is 543*l.* 19*s.* 3*d.* The rental expected is twenty-five houses at 6*s.*, and thirty-five houses at 5*s.*, 845*l.*, from which has to be deducted 281*l.* 13*s.* 4*d.* for rates, repairs, &c., leaving a net rental of 563*l.* 6*s.* 8*d.*, or showing a clear profit of 19*l.* 7*s.* 5*d.* a year. The two schemes mentioned have been adopted, and the plans have been sent to the Local Government Board.

Crystal Palace Engineering School.—Sir J. Fortescue Flannery, M.P., distributed on Friday last week, at the Crystal Palace School of Practical Engineering, the certificates gained by the successful students during the past term. Several references were made in the course of the proceedings to the excellent appointments gained by the majority of the 1,600 students who had passed through the school since its foundation thirty-one years ago. Among the latest recorded appointments are Mr. H. T. Jackman, executive engineer for Hong Kong under the Government; Mr. W. Evetts, chief draughtsman and assistant locomotive engineer, C.S.A. Railway, Bloemfontein; Mr. S. A. Hollis, assistant engineer, waterworks, Bloemfontein; and Mr. E. M. Bate, surveyor to the Frinton Urban District Council. In his speech, Sir Fortescue Flannery referred to the competition we have to encounter from foreign nations, and said it rested with the technical schools to help England to maintain and improve her position.

Holy Trinity Church, Tredegar-square, E.—An important judgment was delivered on August 6 in the Church House, Westminster, by Sir Lewis Dibdin, Dean of the Arches, in the case of the London County Council *v.* Dundas (the Vicar) and others, which was an appeal by the Council from a judgment of Dr. Tristram, K.C., Chancellor of the Diocese of London. In August, 1900, Dr. Tristram granted a faculty, on the petition of the vicar and churchwardens, for some additions to the parish church of Holy Trinity, comprising an enlargement of the east aisle of the chancel, which is at the north end of the church, for a side chapel, vestries for the clergy and choir on either side of the south (the conventional west) end, and a new parish room over the two vestries to extend across the south end. The parish room was intended for vestry meetings, missions and other religious services, Sunday schools, and kindred parochial purposes. But Lord Tredegar, chief ground landlord in the parish, and whose father, Sir Charles Morgan, Bart., gave the fabric and site, took exception to the altering of the front of the church by a departure from the original design of 1839, and proposed that the vestries and parish hall should be erected at the north instead of the south end. Thereupon, on June 27, 1901, Dr. Tristram ordered a supplemental faculty to issue—no opposition being made—for the building of two vestries on the east side, and a larger hall, 80 ft. by 40 ft., with sitting room for 240 persons, on the north side behind the chancel—the chancel being extended, and the south wall of the hall serving as the north wall of the church. The order under appeal set out in greater detail the uses to which the hall was to be put, with the addition that it might be made to serve "for other ecclesiastical purposes, but not for any secular purposes." The graveyard as an open space or garden has latterly been under the care and control of the London County Council, who, in March, 1902, after the works had been begun, filed a petition in the Consistory Court asking for a revocation or amendment of the second faculty, on the grounds that, in terms of the Disused Burial Grounds Act, 1884, no buildings can lawfully be erected upon any disused burial ground except for the enlargement of a church or other place of worship, and that the projected parish-hall did not come within those exceptions. The learned Chancellor, having satisfied himself as to the cause of the Council's non-appearance in June, 1901, adjudged (July 31, 1902) that, whilst the Consistory Court had jurisdiction to issue a faculty for a vestry-hall in the situation proposed, and communicating with the church, the desired faculty should be expressly worded so as to preclude the use of the room for secular objects, and that he felt able to grant authority for its use as a vestry-room for purposes of the church. The London County Council appealed from that order. In the course of a long and exhaustive judgment, in which he reviewed the powers and jurisdiction of the two Courts, the Dean of Arches stated that, in his opinion, the hall, as not serving directly or indirectly the primary purpose of a church, could not be deemed an "enlargement of the church" within the scope and meaning of the Act, and that the faculty was, to a certain extent, contrary to the provisions of the Act, and invalid. Sir Lewis Dibdin then showed how he thought it by no means followed that the Consistory Court or the Court of Arches could entertain the petition of the Council inviting the Consistory Court to re-hear the matter and reverse its decision. Taking, however, the view that he did of the invalidity of the faculty so far as the hall is concerned, he considered the right course would be to vary the order by omitting certain provisions, which might be taken to reaffirm the faculty in respect of the hall, and merely to dismiss the petition without costs.

Electric Lighting Scheme, Bootle.—At Bootle, on the 6th inst., a Local Government Board inquiry was held into the application of the Bootle Town Council for sanction to borrow 40,000*l.* for purposes of electric lighting, and 2,500*l.* for the purpose of laying out certain land in Stanley-road fronting the South Recreation Ground as public walks and pleasure grounds. The inspector was Mr. W. O. E. Meade-King.

The Architect to the Board of Education.—In the House of Commons, on Tuesday, Mr. Lambert asked the Secretary to the Board of Education what length of time Mr. Robson had served as consulting architect to the Board of Education; whether he had received notice that his services would be terminated on September 30; was such notice due to his incompetence, if not, what was the reason for it; and whether, in view of appeals permitted by the Education Act to be made by the denominational managers to the Board of Education, he would take steps to secure that the highest expert assistance should continue to be at the service of the Board. Sir W. Anson replied that Mr. Robson had been engaged for eighteen and a half years as Consulting Architect to the Board of Education. "His engagement will terminate on September 30. No question of the competency of Mr. Robson is involved. The Board of Education are making new arrangements to meet new conditions, and will, of course, take care that they are properly provided with expert assistance in the matters to which the question refers."

Columbus Circle Station, New York.—One of the most important stations on the New York Rapid Transit Subway is that taking its name from the Columbus Statue, near Sixtieth-street. The roof is carried on steel columns and girders, with concrete roofing between the latter, and lighting is effected by vault lights in the footpaths, and by incandescent electric lamps. This station includes four tracks, two for express and two for ordinary traffic. Some interest attaches to the method adopted for underpinning the Columbus Statue, which is about 75 ft. high and weighs nearly 725 tons. The statue is partly undermined by the station works, and during excavation it was supported by a pair of heavy steel girders, carried on two timber trestles. In order to prevent any subsidence of the old work, a new foundation of rubble and concrete with a central steel column was carried down beneath a part of the area to a level lower than that of the station foundations. The permanent steelwork was then erected, and after the concrete filling had been placed and allowed to set for a sufficient time, the temporary supports were removed, and the remaining spaces were filled up.

Exports of Timber from Norway.—From official returns it appears that the quantity of timber exported from the whole of Norway in 1902 was 1,961,725 cubic mètres, made up of 598,568 cubic mètres of planed timber, 536,174 of sawn, 105,686 of hewn, 542,375 of round, 85,506 of staves, &c., and 93,416 of laths. In 1901 the exports amounted to 1,805,224 cubic mètres, and in 1900 to 2,002,243. What proportion of the exports was taken by the United Kingdom in 1902 has not yet been ascertained, but in 1901 such proportion amounted to 1,187,200*l.* in value, and it will be observed that in 1902 the total export was larger by nearly 10 per cent. than in that year. The principal exporting centres are Fredrikstad, Christiania, Drammen, Frederikshald, and Porsgrund. From Fredrikstad the export increased considerably in 1902 compared with the two previous years. The total quantity exported from that port was 568,404 against 534,763 cubic mètres in 1901 and 553,744 cubic mètres in 1900. Of flooring boards 225,225 cubic mètres went to the United Kingdom and 35,884 and 24,034 cubic mètres to Africa and Australia respectively. The prices for the Colonies ruled from 7*l.* 10*s.* to 8*l.* 5*s.* for white, and 8*l.* 10*s.* to 9*l.* 5*s.* for red f.o.b. From Christiania the exportations in 1902 amounted to 202,472 cubic mètres, compared with 200,792 in 1901 and 231,585 in 1900. At Frederikshald the total export in 1902 was 5,204,720 British cubic feet, as against 5,172,932 cubic feet in 1901. The termination of the war in South Africa caused increased demand from the United Kingdom and Colonies, raising prices 10 to 15 per cent. Of the various descriptions, the greatest demand was for planed and sawn timber. Attention has been called at Porsgrund to this peculiar feature in the present state of the sawn timber trade: that white wood is selling at comparatively higher prices than red, a circumstance which is thought to be due to the continually increasing drain on white wood logs by the pulp mills. About 21 per cent. of the total area of the country, or 26,324 square miles, is considered to be covered by forests. The consumption of timber has been enormous, but more replanting is going on—a precaution that is very necessary if this important Norwegian industry is to hold its own, for in some parts of the country the felling goes on faster than the growth.

Safe Deposit, Belfast.—The Ocean Accident and Guarantee Corporation, Ltd., have opened a safe deposit in Chichester-street, Belfast. The safe deposit has been built to the plans of Messrs. Young & Mackenzie, architects, by the Ratner Safe Co., Ltd., London.

Electricity Scheme, Ludlow.—At a meeting of the Ludlow Town Council recently it was decided to make application to the Local Government Board for powers to borrow 8,250*l.* for carrying out a scheme of electric lighting, and for the purpose of a refuse-destructor. The scheme has been prepared by Mr. John Parker, Hereford.

A Crematorium for Sheffield.—At a recent meeting of the Burial Grounds Sub-committee of the City Council it was resolved that detailed plans of the proposed crematorium to be erected at City-road Cemetery, submitted by the architect (Mr. Chas. Hadfield), be approved, and that the Town Clerk be instructed to forward the same to the Local Government Board and to the Home Secretary for their approval.

Extension of the Mall to Charing Cross.—The Office of Works have taken the necessary steps to carry out the long-projected scheme of extending the Mall to Charing Cross. The whole of the Crown property on the south side of Spring-gardens, until recently occupied by Admiralty departments, will shortly be demolished. The raw material will be sold by auction, and immediately after the work of demolition will be commenced. The old corrugated buildings in the Admiralty gardens will also come down. In order to carry out the enterprise, the Office of Works have acquired blocks of commercial and other property on the north side of Spring-gardens and in Charing Cross, the expenditure involved in this part of the scheme being nearly 100,000*l.* One of the buildings to come down is the Architect's department (Factories' section) of the London County Council. The tenants of the scheduled property have already commenced to leave. After the demolition of the Crown property, the extension scheme will be commenced, and will be pushed forward with as little delay as possible. The clearance will improve considerably the frontage of the County Council buildings in Spring-gardens. —*Pall Mall Gazette.*

Window, Ince Parish Church, Lancashire.—A stained window has just been placed in Christ Church by Mrs. Richard Johnson, of Ince Hall, Mayoress of Wigan. The subject is the "Angel Announcing the Resurrection to the Women at the Tomb." The artists were Messrs. Holt, of Warwick.

CAPITAL AND LABOUR.

JOINERS' STRIKE, SUNDERLAND.—The adjourned conference between representatives of the masters and house joiners at Sunderland, called on the initiative of the Mayor (Councillor H. J. Turnbull) for the purpose of discussing the strike, was held on the 7th inst. in the Mayor's parlour at the Town Hall, the chair being again occupied by his Worship. At the first meeting, a week ago, the Mayor threw out suggestions for a settlement on the following lines:—That the masters withdraw their notice of a reduction of ½d. per hour and the men their notice for an advance of ½d.; that work be resumed at the old rate (9½d.); and that the question of an advance be considered three months hence. Both sides had considered these suggestions, and their replies were now read. The communication from the men's society stated that they had, at a mass meeting, unanimously voted against the Mayor's suggested terms of settlement. The letter added—"We trust that some more reasonable offer will be made by the employers. . . . . The fact of the joinery being the only trade that finds the tools to do the work, and is paid 2s. 1d. less than the rest of the workmen engaged in the building trade, make us think our request is only a reasonable one." The letter from the Masters' Association stated that they had passed the following resolution:—"That the terms of the agreement set out in the Mayor's letter be confirmed by this Association as a basis of settlement of the dispute." After these letters had been discussed for a couple of hours, the Mayor made some fresh suggestions, to the following effect:—That arbitration be accepted by both sides, as between 9½d. and 10d. per hour. The joiners to take the instructions of their general body with a view of a ballot being taken on the question by the men affected only; and, if found favourable, the matter to be forthwith submitted to an arbitrator to be appointed by the Board of Trade. Meanwhile, work to be resumed on the understanding that the decision of the arbitrator shall take effect as from the date of the award. This further effort of the Mayor to bring about a settlement will now be brought before the respective Associations.

LEGAL.

CHELSEA ANCIENT LIGHT DISPUTE.

IN the Chancery Division this week Mr. Justice Farwell concluded the hearing of the case of Barr v. The City & Suburban Electric Carriage Co. (1903), Ltd.

Mr. C. G. Jenkins, K.C., and Mr. Christopher James appeared for the plaintiff, and Mr. W. H. Upjohn, K.C., and Mr. Percy Wheeler for the defendants.

Mr. Jenkins, in opening the case, said the action was for an injunction and damages brought by the plaintiff in respect of the obstruction of an ancient light. The plaintiff, Mr. Barr, was the lessee and occupier of a block of buildings. If he (counsel) could prove that the plaintiff's light was ancient he did not think it could be contended that he was not entitled to succeed in the action, as it was apparent there was obstruction of the plaintiff's light by the defendants' building operations. The plaintiff's premises were known as No. 4, Markham-terrace, Blenheim-street, Chelsea, the plaintiff carrying on there the business of a builder and decorator. These premises were a cottage or small house, and in the rear was a builder's yard with a workshop. The plaintiff's lease was dated June 16, 1900, and he had the premises for a term of 7¾ years from Midsummer, 1900. The particular light obstructed was in the ground floor room used as a painters' shop, &c. The shop consisted of two floors. On the first floor was a carpenter's shop—a well-lighted room—and there was no obstruction of that. The ground floor room had a window in the south wall which was essential for its use as a painters' shop, &c., where the men mixed paints and matched the tints of wall papers. That light was an ancient light. The defendants had built a wall only 12 in. away from the plaintiff's premises on the south side.

In answer to his lordship, the learned counsel said that the wall erected by the defendants was only about 1 ft. away from the window in the plaintiff's painters' shop. The defendants' ground was higher than the plaintiff's, and the top of the defendants' wall was 2 ft. 5 in. above the plaintiff's window.

His lordship remarked that he supposed there was only one issue.

Mr. Upjohn said there would in any event be a question as to what damage the plaintiff had suffered. If Mr. Jenkins established an ancient window, he (Mr. Upjohn) should submit that the plaintiff was only entitled to very small damages. He should ask that after the first witness for the plaintiff was called that all the witnesses on both sides should leave the Court.

Mr. Jenkins said that, of course, he had no objection to make to that proposal.

Continuing, the learned counsel said it would be seen from the plans that the only other light to the painters' shop besides that mentioned was from a door which was partially glazed, on the north side. There was very little light coming from that, because it was very small, and it was obstructed by buildings in the rear. It was rather speculative to say what the defendants' second wall did—which was further off than the one within 12 in. of the plaintiff's premises, and parallel with it—but it was clear that if the nearest wall was not there, there would be some obstruction to the plaintiff's window from the further wall. The defendants had been very concise in their defence. They said that the plaintiff's window was made within the last two years, and got an adjournment of the case on the ground that they had got a witness abroad who was coming to say it was only built within that time. Unless he (Mr. Jenkins) had been very much misdirected, the defendants had been very much misdirected. The history of the premises was this: Until the plaintiff took his lease on June 16, 1900, the property was in the possession, and was owned by, a Mr. Leggett, who died in the year 1899, and it was after his death that the plaintiff took the premises. Mr. Leggett was also a builder and used this yard of his for storing ladders. The plaintiff himself knew Leggett and did business with him, and had been into the premises and into this room. But he fairly said he did not notice how it was lighted, and did not notice that until he took possession. Mr. Leggett did not at first live on the premises, but close by. When he first had the workshop this particular window did not exist—in 1878. Leggett had intended to move into this place and to use this painters' shop as a kitchen and living-room, and his son, who would be called as a witness, himself, in the early part of 1878, in order to make this room suitable for use as a kitchen and living-room, match-boarded the ceiling, put in a range and chimney, and made this window to give some light, and there was to this day the range and the chimney there. He should call Leggett and corroborating witnesses as to this. The learned counsel said it was very important for the plaintiff to have a good light in the painters' shop, and he should call evidence to show that since the obstruction had occurred the place could not be used as a painters' shop, and the plaintiff had to make other arrangements accordingly. The plaintiff had a suite of rooms at Chelsea, which he formerly let for 16s. a week, and instead of letting the rooms he used one of them as a painters' shop. That was inconvenient, and he (Mr. Jenkins) should ask his lordship to give the plaintiff some small amount of damages, even if he granted the injunction. If no injunction was granted he should ask for larger damages.

His lordship said he should have no discretion if the plaintiff proved substantial damage.

Mr. Jenkins submitted that if the plaintiff proved his light was ancient, a mandatory injunction would necessarily follow with regard to the nearest wall. He did not ask for a mandatory injunction with regard to the further wall, because the obstruction was not so great with regard to that wall. He submitted, however, that there was material obstruction from the further wall.

Mr. Upjohn suggested that it would save time if the question of whether the light was ancient or not was discussed first.

His lordship remarked that he could not see how the defendants could deny that there was some obstruction of the light coming to the plaintiff's window by reason of the defendants' nearest wall.

Mr. Upjohn said he would agree that there was some obstruction; but he understood that the window in question could not be used for any purpose of enjoyment. The window was set in a deep embrasure.

Mr. Jenkins then called evidence in support of his case, and in the result his lordship, after having heard some evidence on behalf of the defence, held that the plaintiff's light was ancient, and granted the injunction as prayed with regard to the nearer wall of the defendant's building. He also awarded the plaintiff 23*l.* 13*s.* damages.

Judgment accordingly for the plaintiff with costs.

PATENTS OF THE WEEK:

APPLICATIONS PUBLISHED.*

15,203 of 1902—R. J. WORRALL: *Fences and Gates and Doors Therefor.*

The door may be formed of a series of bars. The bars are connected together by lazy tongues, which hold them together at a given distance apart or permit them to fold closely together, and thus occupy a reduced space. Or the door may be formed of bars intersecting each other as a lattice work and connected at their intersections pivotally. The intersecting bars may be mounted to outside styles or framework by means of studs working in open slots. The slots may be formed in plates, and the plates mounted upon one or both sides of the style or framework, or the slots may be formed of tongue shape with an extra thickness at the root. The tongue may be secured by its root to the style or framework. Thus while the slot is rigidly fixed to the style or framework the stud is allowed to move freely in the slot, and allow the intersecting bars or lattice to fold so as to be approximately parallel to each other, or to move upon their pivots and form angles with each other. Thus the door is able to expand and contract, and the expanded door may be strengthened by means of crossbars, and may be opened by sliding horizontally or vertically.

15,396 of 1902.—THE BARNSLEY BRITISH CO-OPERATIVE SOCIETY, LTD., and M. E. TUNE: *Ventilator for Extracting Foul Air, Noxious Fumes, and the Like from Churches, Schools, and Other Large Buildings.*

A ventilator consisting of a central chamber, enlarged chamber, cones and winguard suitably arranged, enabling the wind blowing in any direction to cause a suction.

15,606 of 1902.—J. T. SZEK: *Means for Deodorising or Disinfecting Urinals, Stables, and the Like.*

A composition adapted for use as a sanitary and disinfecting material for covering walls, floors, and the like, consisting of a mixture of peat, infusorial earth, a disinfecting liquid containing cresyl compounds and cementitious or other binding material.

15,893 of 1902.—E. H. CUMMINS: *Casement Fasteners.*

In a casement fastener of the V-type the combination of two links, the meeting end of one of these being provided with an elongated slot, and the meeting end of the other with a square orifice. It further consists of the combination of two links and the bolt square where it passes through the square orifice of one of the links and threaded at one extremity to receive a binding.

17,969 of 1902.—A. F. BUDDEN: *Domestic Fireplaces.*

This invention relates to domestic fireplaces, and the objects thereof are to consume the smoke and also to provide a means of using coal or like fuel, or gas, either or both, as the heating means, as the occasion may require. In carrying this invention into effect, the fireclay lump or back of the stove is, from the point above the grate, carried upward and forward at a suitable angle or inclination so as to overhang the grate. Upon the inclined part of the back are mounted a series of vertically or otherwise disposed grids or frames of lattice or open work, formed of cast-iron or other suitable metal, and beneath which grid or frame is arranged a Bunsen or other suitable burner, or several such burners might be so employed. Extending across the back of the fireplace, and communicating with the burners, is a gas-supply pipe, which, in a confined position, is furnished with a cock by the aid of which the gas-supply may be controlled.

19,435 of 1902.—F. W. BROADBENT AND C. E. HOLLIDAY: *Machine for Moulding, Pressing, or Repressing Tiles, Bricks, and such like articles from Plastic or Powdered Substances.*

This invention consists of a machine worked by hand or other power for moulding, pressing, or repressing articles from plastic or powdered substances, more especially quarries and tiles and such like objects from clay. In carrying the invention into effect loose plates are provided, preferably of metal and with or without pattern, to be inserted flatways at right angles to the applied force between the clots, bats, bricks, quarries, tiles, or other such like mass of plastic clay or layers of clay dust, lime, or whatever material may be used, thus separating them one from another, but at the same time allowing the pressure applied to the outer one by screw, lever, or other means to be imparted to them all. Provision is also made for quickly and accurately feeding the die-box with the clay clots and plates, and also for delivering those that have already been pressed.

19,915 of 1902.—A. E. BROWN: *Drying Chambers, or Drying Floors, or the Like, for Drying Bricks, Tiles, Pottery, Terra-cotta, or for the Like Purpose.*

In means for drying bricks, tiles, pottery, terra-cotta, or for the like purpose, the arrangement and combination of flues for obtaining a uniform distribution to the goods to be dried of the heat from waste gas of comparatively low temperature or other products of combustion of any desired temperature or from heated air, such arrangement comprising a longitudinally disposed service flue and a longitudinally disposed collecting flue in combination and acting in conjunction with a series of cross flues each connecting said service and collecting flues with a series of cross flues extending above the ground or paving, supporting same and spaced apart from one another in such wise as to be adapted to permit sand or other non-combustible material to be filled in between the adjacent sides of said cross-flues, and to be removed therefrom to thereby regulate the extent of the heat surface of said cross flues, said flues being of ample cross-sectional area to permit the free passage there through of large volumes of said hot gases or heated air.

21,168 of 1902.—J. L. A. POLLARD: *Heating Stove.*

A heating stove comprising an ash-pit, surmounted by fire bars and a fire door. This arrangement forming the hearth or fireplace is situated beneath an earthenware or pottery column, formed by elements placed one above the other, and hermetically sealed at their junctions by means of joint rings or packing lodged in grooves provided for that purpose in the ends of the elements. Each of these elements is divided by a vertical earthenware partition wall, which, starting from the hearth, or fireplace, rises as far as the lower end of the last element. This last element terminates the column, which is closed by a plug or cap, also made

* All these applications are in the stage to which opposition to the grant of Patents upon them can be made.

of earthenware. The whole is held by iron bands. A flue is arranged behind the hearth, and the stove-pipe or chimney is placed on the said flues. The gases from the hearth rise in one of the two compartments of the column, and descends at the back of the partition wall in order to escape into the chimney. Coal, coke, wood, oil, or other suitable fuel can be burnt in the hearth or fireplace.

21,196 of 1902.—J. C. CHRISTENSEN: *Locks or Fastenings.*

In locks or fastenings of the kind in which the bolt is pushed back by a pressure at right angle with the plane of the door, the bolt is movable in the lock case and provided with a slot and with two pins in combination and acting in conjunction with two bent tubes attached to the lock case, and each of which at one end extends into the slot and over the pins; while the other end of each said tube terminates within the knob of the door, a pin mounted upon a movable press button, the pin being movable inside the tube end, and a series of balls in each said tube, filling the interval between the ends of the pins, so that when one of these is pushed into the tube the other is simultaneously withdrawn and pushed outwardly from same.

23,687 of 1902.—J. R. MAYFIELD: *Fireplaces.*

This consists of providing a fireplace with a double bottom, one or both bottoms being perforated and adapted to slide relatively to the other or one another; so that by moving one or both, as the case may be, the perforations may be opened and closed, and ashes allowed to fall through or be retained as desired.

24,830 of 1902.—F. W. ADAMS; *Door-Springs.*

According to the invention a long spiral spring is rotated in a U-shaped groove or recess formed along the centre of the top of the door, the said spring being either partially or wholly enclosed in a casing. Through this spring is passed a rod, the outer end of which carries a nut, against which the end of the spring bears, and by adjusting which the tension of the spring can be regulated. The inner end of the rod is secured to one end of a chain, the other end of which is fastened or pivotted to that part of the hinge which is affixed to the door-post. The inner end of the spring bears against the other half of the hinge, *i.e.*, the part secured to the door, so that it will be seen that the spring tends to hold the door tightly against the door-post.

2,475 of 1903.—W. R. SPRINGER: *Hinges.*

This invention consists in the combination with a casing or frame having a vertical mortise in one side thereof, a door or the like element, an attaching plate countersunk in said mortise, and having a vertical V-shaped socket with dove-tailed side edges, the length of said attaching plate being less than that of said mortise, and a hinge having one leaf attached to the door and the other leaf provided with a V-shaped offset adapted to fit in the socket of said attaching plate, the mortise in which said attaching plate is countersunk, adapting said hinge to be raised with the door to disconnect it offset from the socket of said attaching plate.

3,974 of 1903.—H. N. HAUG: *Houses for Drying Fish and the Like.*

This invention consists of a house for drying fish and the like, the combination of a chamber in which the air admitted from without is heated, a drying-room through which the air introduced from the heating chamber through apertures in the floor at one end of the room, pass over the fish at a constant speed, the fish being equally distributed in the room and suspended with its flat side parallel to the direction in which the air is flowing, an exhaust chamber, through which the air is again ejected into the atmosphere.

4,821 of 1903.—R. C. CARPENTER: *Apparatus for the Manufacture of Cement.*

This invention relates to apparatus for producing cement, and it relates especially to apparatus for producing cement by the rotary process, in which the heat issuing from the cement kilns is utilised in various ways, such as heating a boiler or economiser or dryer.

15,834 of 1902.—F. S. PLANT: *Single or Duplex Gauge for Gauging Bricks and the Like.*

According to this invention the apparatus for gauging bricks and the like consists essentially of a flat piece of iron or other suitable material, preferably about 7½ in. long, 1⅞ in. wide, and ⅛ in. in thickness. A slot is made to thin off an inch of its length, it is then set out in inches and parts of inches, as in the case of the ordinary 2-ft. rule. The stop is inserted through the slot and secured on the other side by means of a wing nut and washer.

19,005 of 1902.—H. L. DOULTON: *Flushing Siphons for Sewage and the Like.*

In flushing siphons with two or more outlets, the adoption of ventilating pipes from said outlet for the more ready escape of air. Said ventilating pipe to be entirely separate or joined into one or more pipes.

19,476 of 1902.—R. H. RADFORD: *Gulleys, Gulley-Traps, and Silt Boxes.*

In gulleys, gulley traps, and silt boxes the arrangement and combination of parts and appliances, by which the lining or tray for catching the mud or silt, and the bell or trap are constructed in one, so that the bell portion of the tray is only slightly higher than the top of the waste pipe, and the bottom of the tray or silt box is considerably below the level of the waste-pipe, thus forming a combined bell trap and tray which can be removed at one operation for cleaning.

27,283 of 1902.—A. G. BOYS: *Wood-paving Blocks.*

The said invention consists essentially in making up rectangular blocks of wood, such as are used for roadways and pavements; the said block consists of several small sections cut from waste timber into rectangular blocks of uniform widths and connected together so as to present the end grain uppermost. The said sections are connected together by cutting a dovetail slot along both the longitudinal sides of the block and fit therein a strip of wood so as to bind the whole of the sections together; several wire staples are then driven in, allowing one end of each staple to enter each alternate block, and so clamping and tightening the whole together. In some cases dovetail strips may be used without the staples, or staples without the strips may be used to connect the sections together to form one rectangular block.

6,345 of 1903.—G. JONES: *Fire-escapes.*

A fire-escape which comprises a ladder, of which the sides are chains and the steps are metal bars, and of which the bottom step or bar is of a length which ensures that it will project a considerable distance at each side of the ladder in order that the ladder may be rolled up upon said bar and readily unrolled without entanglement. Means are provided for preventing ladder from turning when suspended, and from unrolling after it is rolled up.

5,323 of 1903.—W. W. WILLIAMS: *Drain-pipe.*

The pipe increases in thickness from the spigot end to the back part of the socket, thus making the collar of double the thickness of an ordinary drain-pipe.

7,262 of 1903.—W. BUSSE: *Perforated Draining and Drying Slate Tiles.*

This invention relates to tiles for draining and drying wood pulp or fibrous or other materials. The object being to replace clay tiles by providing perforated slabs of solid slate of novel construction with conically or roundly perforated orifices performed by mechanical means, either in layers or circular form, and destined to the formation of double bottoms and similar purposes.

5,921 of 1903.—M. H. RYLATT: *Earthenware Pipes and the Like.*

A pipe for drainage and the like purposes, having one or more sockets, in which are formed any suitable number of sloping ribs to guide and support the spigot end of the pipe to be joined to socket or pipe.

11,083 of 1903.—K. SPATZ, *nee* KÜHLER: *Production of Mosaic Work.*

This relates to the production of mosaic work, and consists in the combination of plate glass of any colour and transparency, said plate plate glass being provided in a suitable manner on one of its surfaces with a rough backing, and thereupon cut into small pieces of the required size.

12,636 of 1903.—W. N. WIGHT: *Concrete Structures.*

The construction of a concrete flooring with a wire fabric embedded in the concrete and suspended between the flooring supports, the fabric being composed of straight wires in the direction transverse to the supports and cross wires at right angles to said straight wires, for spacing the same, and bound thereto at the crossing points.

13,115 of 1903.—H. H. LAKE (W. SPANGHER): *Parquet Flooring.*

In parquet flooring, which consists in providing the pieces or plates or wooden parquet flooring upon the lower face with a layer of asphalt of special composition, adhering, on the one hand, strongly to the wood and, on the other, to the cement constituting the bed of the flooring, this layer of asphalt presenting upon its lower face—for the purpose of increasing its adhesion to the cement—projections or protuberances, obtained by pressing by means of a die, which is applied to the asphalt whilst still hot and soft.

MEETINGS.

AUGUST 17 to 22.

Junior Institution of Engineers.—Summer meeting at Sheffield. The proceedings will be opened at the Town Hall at 11 a.m. by the Lord Mayor of Sheffield.

SATURDAY, AUGUST 22.

Northern Architectural Association.—Excursion meeting, Blagdon and Stannington. Members to assemble at the lodge gates of the principal entrance to Blagdon Hall at 3.30 p.m.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

July 25.—By IRELANDS' (at Norwich).

Whitwell, Norfolk.—The Home Farm and Whitwell Tannery, 217 a. 3 r. 22 p., f. and c.	£5,500
Great Witchingham, Norfolk.—Blackwater and Reynold's Farms, 226 a. 3 r. 11 p., f. and c.	3,800
Various enclosures, 34 a. 2 r. 39 p., f. and c.	870
Copyhold cottage and 1 a. 1 r. 33 p.	165
15 freehold and copyhold cottages	870
Themelthorpe, &c., Norfolk.—Old Hall and Heath Farms, 317 a. 0 r. 20 p., f. and c.	4,200

By SPELMANS' (at Norwich).

Great Snoring, Norfolk.—Freehold rent charge of 43*l.* 5*s.* 8*d.*	£1,030
July 28.—By MORRIS, MARSHALL, & POOLE (at Newtown).	
Caersws, Montgomery.—The Unicorn Hotel and 1 a. 2 r. 20 p., f., y.r. 30*l.*	1,850
Pendinas, f., y.r. 25*l.*	510
Two freehold fields, 3 a. 2 r. 33 p., y.r. 11*l.*	340
Llanwnog, Montgomery.—Llesat Uchaf Farm, 63 a. 3 r. 12 p., f., y.r. 16*l.*	490
July 30.—By WALTON & LEE (at York).	
Pickering, &c., Yorks.—The Keldy Castle Estate, 6,843 a. 2 r. 0 p., f. (in one lot)	25,000
By BALLS' (at Sudbury).	
Cavendish, Suffolk.—Church Farm, 29 a. 1 r. 1 p., f.	810
By BIDWELL & SONS (at Ely).	
Mildenhall, &c., Suffolk.—Harris Farm, 412 a. 1 r. 5 p., f.	4,750
August 3.—By A. MARTIN NEWCOMBE.	
Barnsbury.—83, Roman-rd. (dairy premises), u.t. 58 yrs., g.r. 6*l.* 10*s.*, y.r. 35*l.*	685
Clapham.—1, Killyon-rd., u.t. 90 yrs., g.r. 8*l.*, e.r. 43*l.*	470
By PENDERED & SON (at Wellingborough).	
Chelveston, &c., Northants.—Freehold farmhouse and 151 a. 2 r. 23 p.	1,750
Freehold house	175
Freehold close, 10 a. 1 r. 21 p.	210
Irthlingborough, Northants.—Two copyhold closes, 8 a. 3 r. 13 p.	175
August 6.—By H. H. COLLIER.	
Battersea.—266, Lavender Hill, s., u.t. 83 yrs., g.r. 25*l.*, y.r. 85*l.*	1,075
Woking, Surrey.—1, The Terrace, s., f., y.r. 65*l.*	850

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; p. for possession; e.r. for estimated rental; w.r. for weekly rental; q.r. for quarterly rental; y.r. for yearly rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; la. for lane; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; av. for avenue; gdns. for gardens; yd. for yard; gr. for grove; b.h. for beer-house; p.h. for public-house; o. for offices; s. for shops.

PRICES CURRENT OF MATERIALS.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£	s.	d.			
Hard Stocks	1	15	6	per 1,000 alongside, in river.		
Rough Stocks and Grizzles.....	1	12	6	,,	,,	,,
Facing Stocks....	2	12	0	,,	,,	,,
Shippers	2	5	0	,,	,,	,,
Flettons	1	8	6	,,	at railway	depôt
Red Wire Cuts ..	1	12	6	,,	,,	,,
Best Fareham Red	3	12	0	,,	,,	,,
Best Red Pressed Ruabon Facing	5	0	0	,,	,,	,,
Best Blue Pressed Staffordshire ..	4	5	0	,,	,,	,,
Do. Bullnose	4	11	0	,,	,,	,,
Best Stourbridge Fire Bricks	4	8	0	,,	,,	,,
GLAZED BRICKS.						
Best White and Ivory Glazed Stretchers.....	13	0	0	,,	,,	,,
Headers	12	0	0	,,	,,	,,
Quoins, Bullnose, and Flats.....	17	0	0	,,	,,	,,
Double Stretchers	19	0	0	,,	,,	,,
Double Headers..	16	0	0	,,	,,	,,
One Side and two Ends.....	19	0	0	,,	,,	,,
Two Sides and one End	20	0	0	,,	,,	,,
Splays, Chamfered, Squints.....	20	0	0	,,	,,	,,
Best Dipped Salt Glazed Stretchers and Headers	12	0	0		,,	,,
Quoins, Bullnose, and Flats.....	14	0	0	,,	,,	,,
Double Stretchers	15	0	0	,,	,,	,,
Double Headers..	14	0	0	,,	,,	,,
One Side and two Ends.....	15	0	0	,,	,,	,,
Two Sides and one End	15	0	0	,,	,,	,,
Splays Chamfered, Squints.....	14	0	0	,,	,,	,,
Second Quality White and Dipped Salt Glazed	2	0	0	,,	less than best.	

	s.	d.
Thames and Pit Sand	6	9 per yard, delivered.
Thames Ballast	6	0 ,, ,,
Best Portland Cement	30	0 per ton, delivered.
Best Ground Blue Lias Lime..	20	6 ,, ,,

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime ..... 11*s.* 6*d.* per yard, delivered.
Stourbridge Fire-clay in sacks 27*s.* 6*d.* per ton at rly. dpt.

STONE.

BATH STONE—delivered on road waggons, Paddington depôt	s. 1	d. 6½ per ft. cube.
Do. do. delivered on road waggons, Nine Elms depôt	1	8½ ,, ,,
PORTLAND STONE (20 ft. average)—		
Brown Whitbed, delivered on road waggons, Paddington depot, Nine Elms depot, or Pimlico Wharf	2	4 ,, ,,
White Basebed, delivered on road waggons, Paddington depot, Nine Elms depot, or Pimlico Wharf....	2	2½ ,, ,,

PRICES CURRENT (*Continued*).

STONE.

	s. d.		
Ancaster in blocks	1 11	per ft. cube, deld	rly. depôt.
Beer in blocks	1 6	,,	,,
Grinshill ,, ...	1 10	,,	,,
Darley Dale in blocks..	2 4	,,	,,
Red Corsehill ,,	2 5	,,	,,
Closeburn Red Freestone	2 0	,,	,,
Red Mansfield ,,	2 4	,,	,,

YORK STONE—*Robin Hood Quality.*

	s. d.		
Scappled random blocks	2 10	per ft. cube, deld.	rly. depôt.
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2 3	per foot super.	,,
6 in. Rubbed two sides Ditto, Ditto	2 6	,,	,,
3 in. Sawn two sides slabs (random sizes)..	0 11½	,,	,,
2 in. to 2½ in. Sawn one side slabs (random sizes)	0 7½	,,	,,
⅞ in. to 2 in. ditto, ditto	0 6	,,	,,

BEST HARD YORK—

Scappled random blocks	3 0	per ft. cube	,,
6 in. sawn two sides, landings to sizes (under 40 ft. sup.)	2 8	per ft. super.	,,
6 in. Rubbed two sides Ditto	—	,,	,,
3 in. sawn two sides slabs (random sizes)	1 2	,,	,,
2 in. self-faced random flags.....	0 5	,,	,,
Hopton Wood (Hard Bed) in blocks	2 3	per ft. cube. deld. rly. depôt.	
,, ,, ,, 6 in. sawn both sides landings	2 7	per ft. super. deld. rly. depôt	
,, ,, ,, 3 in. do.	1 2½	,,	,,

SLATES.

in. in.	£ s. d.		
20×10 best blue Bangor..	13 2 6	per 1000 or 1200 at ry. dep.	
20×12 ,, ,, ,,	13 17 6	,,	,,
20×12 best seconds ,,	12 15 0	,,	,,
20×12 ,, ,, ,,	13 10 0	,,	,,
16×8 best ,,	7 0 0	,,	,,
20×10 best blue Portmadoc ..	12 5 0	,,	,,
16×8 best blue Portmadoc	6 5 0	,,	,,
20×10 best Eureka unfading green....	15 2 6	,,	,,
20×10 ,, ,,	17 2 6	,,	,,
16×10 ,, ,,	12 10 0	,,	,,
16×8 ,, ,,	10 5 0	,,	,,
20×10 permanent green	11 0 0	,,	,,
16×10 ,, ,,	9 5 0	,,	,,
16×8 ,, ,,	6 10 0	,,	,,

TILES.

	s. d.		
Best plain red roofing tiles..	42 0	per 1,000, at	rly. depôt.
Hip and valley tiles....	3 7	per doz.	,, ,,
Best Broseley tiles	50 0	per 1,000	,, ,,
Do. Ornamental Tiles	52 6	,,	,, ,,
Hip and valley tiles....	4 0	per doz.	,, ,,
Best Ruabon Red, brown or brindled Do. (Edwards)	57 6	per 1,000	,, ,,
Do. ornamental Do.	60 0	,,	,, ,,
Hip tiles	4 0	per doz.	,, ,,
Valley tiles.....	3 0	,,	,, ,,
Best Red or Mottled Staffordshire Do. (Peakes)	51 9	per 1,000	,, ,,
Do. Ornamental Do. 54	6	,,	,, ,,
Hip tiles	4 1	per doz.	,, ,,
Valley tiles.....	3 8	,,	,, ,,
Best "Rosemary" brand plain tiles 48	0	per 1,000	,, ,,
Do. Ornamental Do. 50	0	,,	,, ,,
Hip tiles	4 0	per doz.	,, ,,
Valley tiles	3 8	,,	,, ,,

WOOD.

	At per standard. £ s. d.	£ s. d.	
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in.....	15 10 0	16 10 0	
Deals: best 3 by 9.....	14 10 0	15 10 0	
Battens: best 2½ in. by 7 in. and 8 in., and 3 in. by 7 in. and 8in.....	11 10 0	12 10 0	
Battens: best 2½ by 6 and 3 by 6 ..	0 10 0	less than 7 in. and 8 in.	
Deals: seconds	1 0 0	less than best	
Battens: seconds	0 10 0	,, ,,	,,
2 in. by 4 in. and 2 in. by 6 in. ..	9 0 0	9 10 0	
2 in. by 4½ in. and 2 in. by 5 in. ..	8 10 0	9 10 0	
Foreign Sawn Boards— 1 in. and 1¼ in. by 7 in.	0 10 0	more than battens.	
¾ in.	1 0 0	,,	
Fir timber: Best middling Danzig or Memel (average specification	At per load of 50 ft. 4 10 0	5 0 0	
Seconds	4 5 0	4 10 0	
Small timber (8 in. to 10 in.)	3 12 6	3 15 0	
Small timber (6 in. to 8 in.).....	3 0 0	3 10 0	
Swedish balks	2 15 0	3 0 0	
Pitch-pine timber (30 ft. average)..	3 5 0	3 15 0	

JOINERS' WOOD.

	At per standard. £ s. d.	£ s. d.	
White Sea: First yellow deals, 3 in. by 11 in.....	23 0 0	24 0 0	
3 in. by 9 in.	21 0 0	22 10 0	
Battens, 2½ in. and 3 in. by 7 in.	17 0 0	18 10 0	
Second yellow deals, 3 in. by 11 in.	18 10 0	20 0 0	
,, ,, 3 in. by 9 in.	17 10 0	19 0 0	
Battens, 2½ in. and 3 in. by 7 in.	13 10 0	14 10 0	
Third yellow deals, 3 in. by 11 in. and 9 in.	15 10 0	16 10 0	
Battens, 2½ in. and 3 in. by 7 in.	11 10 0	12 10 0	
Petersburg: first yellow deals, 3 in. by 11 in.	21 0 0	22 10 0	
Do. 3 in. by 9 in.....	18 0 0	19 10 0	

PRICES CURRENT (*Continued*).

WOOD.

JOINERS' WOOD.	At per standard. £ s. d.	£ s. d.	
Petersburg—			
Battens.....	13 10 0	15 0 0	
Second yellow deals, 3 in. by 11 in.....	16 0 0	17 0 0	
Do. 3 in. by 9 in.	14 10 0	16 0 0	
Battens.....	11 0 0	12 10 0	
Third yellow deals, 3 in. by 11 in.....	13 10 0	14 0 0	
Do. 3 in. by 9 in.	13 0 0	14 0 0	
Battens	10 0 0	11 0 0	
White Sea and Petersburg:—			
First white deals, 3 in. by 11 in.	14 10 0	15 10 0	
,, ,, 3 in. by 9 in.	13 10 0	14 10 0	
Battens.....	11 0 0	12 0 0	
Second white deals 3 in. by 11 in.	13 10 0	14 10 0	
,, ,, ,, 3 in. by 9 in.	12 10 0	13 10 0	
,, ,, ,, battens.....	9 10 0	10 10 0	
Pitch-pine: deals	16 0 0	18 0 0	
Under 2 in. thick extra	0 10 0	1 0 0	
Yellow Pine—First, regular sizes ..	33 0 0	upwards.	
Oddments	22 0 0	24 0 0	
Seconds, regular sizes	24 10 0	26 10 0	
Yellow Pine Oddments	20 0 0	22 0 0	
Kauri Pine—Planks, per ft. cube..	0 3 6	0 4 6	
Danzig and Stettin Oak Logs— Large, per ft. cube	0 2 6	0 3 6	
Small ,, ,, ...	0 2 3	0 2 6	
Wainscot Oak Logs, per ft. cube ..	0 5 0	0 5 6	
Dry Wainscot Oak, per ft. sup. as inch	0 0 7	0 0 8	
¾ in. do. do, ...	0 0 6½	- - -	
Dry Mahogany—Honduras, Tabasco, per ft. sup. as inch	0 0 9	0 0 11	
Selected, Figury, per ft. sup. as inch	0 1 6	0 2 0	
Dry Walnut, American, per ft. sup. as inch	0 0 10	0 1 0	
Teak, per load	17 0 0	21 0 0	
American Whitewood Planks— Per ft. cube	0 4 0	- -	

Prepared Flooring—	Per square.		
1 in. by 7 in. yellow, planed and shot.....	0 13 6	0 17 6	
1 in. by 7 in. yellow, planed and matched.....	0 14 0	0 18 0	
1¼ in. by 7 in. yellow, planed and matched.....	0 16 0	1 1 6	
1 in. by 7 in. white, planed and shot.....	0 11 6	0 13 6	
1 in. by 7 in. white, planed and matched.....	0 12 0	0 14 0	
1¼ in. by 7 in. white, planed and matched.....	0 14 6	0 16 6	
¾ in. by 7 inch yellow matched and beaded or V-jointed boards	0 11 0	0 13 6	
1 in. by 7 in. do. do. do.	0 14 0	0 18 0	
¾ in. by 7 in. white do. do.	0 10 0	0 11 6	
1 in. by 7 in. do. do. do.	0 11 6	0 13 6	

6-in. at 6d. to 9d. per square less than 7-in.

JOISTS, GIRDERS, &c.

	In London, or delivered. £ s. d.	Railway Vans, per ton. £ s. d.	
Rolled Steel Joists, ordinary sections	6 5 0	7 5 0	
Compound Girders ,, ,,	8 2 6	9 5 0	
Angles, Tees and Channels, ordinary sections	7 17 6	8 17 6	
Flitch Plates	8 5 0	8 15 0	
Cast Iron Columns and Stanchions, including ordinary patterns	7 2 6	8 5 6	

METALS.

	Per ton, in London. £ s. d.	£ s. d.	
IRON—			
Common Bars.....	7 10 0	8 0 0	
Staffordshire Crown Bars, good merchant quality	8 0 0	8 10 0	
Staffordshire "Marked Bars" ..	10 10 0	- - -	
Mild Steel Bars	8 15 0	9 5 0	
Hoop Iron, basis price.....	9 0 0	9 5 0	
,, ,, galvanised.....	16 0 0	- -	
(* And upwards, according to size and gauge.)			
Sheet Iron, Black.—			
Ordinary sizes to 20 g.	9 15 0	- - -	
,, ,, to 24 g.	10 15 0	- - -	
,, ,, to 26 g.	12 5 0	- - -	
Sheet Iron, Galvanised, flat, ordinary quality—			
Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 20 g.....	12 15 0	- - -	
,, ,, 22 g. and 24 g.	13 5 0	- - -	
,, ,, 26 g.....	14 5 0	- - -	
Sheet Iron, Galvanised, flat, best quality:—			
Ordinary sizes to 20 g.....	16 0 0	- - -	
,, ,, 22 g. and 24 g.	16 10 0	- - -	
,, ,, 26 g.....	18 0 0	- - -	
Galvanised Corrugated Sheets:—			
Ordinary sizes, 6 ft. to 8 ft. 20 g.	12 15 0	- - -	
,, ,, 22 g. and 24 g.	13 5 0	- - -	
,, ,, 26 g.....	14 0 0	- - -	
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. by 20 g. and thicker ..	11 15 0	- - -	
,, ,, 22 g. and 24 g.	12 15 0	- - -	
,, ,, 26 g.	14 0 0	- - -	
Cut nails, 3 in. to 6 in.	9 5 0	9 15 0	

(Under 3 in. usual trade extras.)

LEAD, &c.

	Per ton, in London. £ s. d.	£ s. d.	
LEAD—Sheet, English, 3 lbs. & up.	13 15 0	- - -	
Pipe in coils	14 5 0	- - -	
Soil pipe	16 15 0	- - -	
Compo Pipe	16 15 0	- - -	
ZINC—Sheet—			
Vieille Montagne ..... ton	26 0 0	- - -	
Silesian	25 15 0	- - -	
COPPER—			
Strong Sheet ..... per lb.	0 0 10½	- - -	
Thin ..... ,,	0 0 11½	- - -	
Copper nails ..... ,,	0 0 11	- - -	

PRICES CURRENT (*Continued*).

LEAD, &c.

BRASS—	Per ton, in London. £ s. d.	£ s. d.	
Strong Sheet..... per lb.	0 0 10	- - -	
Thin ,, ... ,,	0 0 11	- - -	
TIN—English Ingots ..... ,,	0 1 4	- - -	
SOLDER—Plumbers' ..... ,,	0 0 6	- - -	
Tinmen's ..... ,,	0 0 8	- - -	
Blowpipe ..... ,,	0 0 9	- - -	

ENGLISH SHEET GLASS IN CRATES.

15 oz. thirds	2½d. per ft. delivered.
,, fourths.....	1¾d. ,, ,,
21 oz. thirds	3½d. ,, ,,
,, fourths.....	2⅝d. ,, ,,
26 oz. thirds	3¾d. ,, ,,
,, fourths.....	3⅛d. ,, ,,
32 oz. thirds	4½d. ,, ,,
,, fourths.....	4⅛d. ,, ,,
Fluted sheet, 15 oz.	2⅛d. ,, ,,
,, 21 oz.	3⅛d. ,, ,,
½ Hartley's Rolled Plate	1¾d. ,, ,,
⅝ ,, ,, ,, ...	2d. ,, ,,
¾ ,, ,, ,, ...	2¼d. ,, ,,

OILS, &c.

		£ s. d.	
Raw Linseed Oil in pipes or barrels..	per gallon	0 1 10	
,, ,, ,, in drums.....	,,	0 2 2	
Boiled ,, ,, in pipes or barrels..	,,	0 2 1	
,, ,, ,, in drums.....	,,	0 2 5	
Turpentine, in barrels	,,	0 3 3	
,, in drums	,,	0 3 6	
Genuine Ground English White Lead	per ton	19 10 0	
Red Lead, Dry	,,	19 10 0	
Best Linseed Oil Putty.....	per cwt.	0 8 0	
Stockholm Tar.....	per barrel	1 12 0	

VARNISHES, &c.

	Per gallon. £ s. d.	
Fine Pale Oak Varnish	0 8 0	
Pale Copal Oak.....	0 10 6	
Superfine Pale Elastic Oak	0 12 6	
Fine Extra Hard Church Oak	0 10 0	
Superfine Hard-drying Oak, for Seats of Churches.....	0 14 0	
Fine Elastic Carriage	0 12 6	
Superfine Pale Elastic Carriage	0 16 0	
Fine Pale Maple	0 16 0	
Finest Pale Durable Copal	0 18 0	
Extra Pale French Oil	1 1 0	
Eggshell Flatting Varnish	0 18 0	
White Copal Enamel	1 4 0	
Extra Pale Paper	0 12 0	
Best Japan Gold Size	0 10 6	
Best Black Japan	0 16 0	
Oak and Mahogany Stain	0 9 0	
Brunswick Black	0 8 6	
Berlin Black	0 16 0	
Knotting	0 10 0	
French and Brush Polish	0 10 0	

PUBLISHER'S NOTICES.

THE INDEX (with TITLE-PAGE) for VOLUME LXXXIV. (January to June, 1903) was given as a supplement with the number for July 11.

CLOTH CASES for Binding the Numbers are now ready, price 2s. 6d. each; also

READING CASES (Cloth), with Strings, price 9d. each.

THE EIGHTY-FOURTH VOLUME of "The Builder" (bound), price Twelve Shillings and Sixpence.

SUBSCRIBERS' VOLUMES, on being sent to the Office, will be bound at a cost of 2s. 6d. each.

CHARGES FOR ADVERTISEMENTS.

COMPETITIONS, CONTRACTS, ALL NOTICES ISSUED BY CORPORATE BODIES, COUNTY AND OTHER COUNCILS, PROSPECTUSES OF PUBLIC COMPANIES, SALES BY TENDER, LEGAL ANNOUNCEMENTS, &c. &c.

Six lines, or under.....6s. 0d.
Each additional line.....1s. 0d.

SITUATIONS VACANT, PARTNERSHIPS, APPRENTICESHIPS, TRADE AND GENERAL ADVERTISEMENTS.

Six lines (about fifty words) or under .....4s. 6d.
Each additional line (about ten words).....0s. 6d.

Terms for series of Trade advertisements, and for front page, and other special positions, on application to the Publisher.

SITUATIONS WANTED (Single-handed—Labour only).

FOUR lines (about thirty words) or under .....2s. 6d.
Each additional line (about ten words).....0s. 6d.

PREPAYMENT IS ABSOLUTELY NECESSARY.

"*" Stamps *must not* be sent, but all sums should be remitted by Postal Orders, payable to J. MORGAN, and addressed to the Publisher of "THE BUILDER," Catherine-street, W.C.

Advertisements for the current week's issue are received up to THREE o'clock p.m. on THURSDAY, but "Classification" is impossible in the case of any which may reach the Office after HALF-PAST ONE p.m. on that day. Those intended for the Outside Wrapper should be in by TWELVE noon on WEDNESDAY.

ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same must reach the Office before TEN o'clock on WEDNESDAY MORNING.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

PERSONS Advertising in "The Builder" may have *Replies addressed to the Office*, Catherine-street, Covent Garden, W.C. *free of charge*. Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage. Unused stamps are returned to advertisers the week after publication.

AN EDITION Printed on THIN PAPER, for FOREIGN and COLONIAL CIRCULATION, is issued every week.

READING CASES, { NINEPENCE EACH. By Post (carefully packed) 1s.

TERMS OF SUBSCRIPTION.

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COMPETITIONS, CONTRACTS AND PUBLIC APPOINTMENTS.

(For some Contracts, &c., still open, but not included in this List, see previous issues.)

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered
*New Hospital	Brighton & Hove Hosp for Women	50*l.*, 30*l.*, and 20*l.*	Nov. 9
*Stone Bridge over Medway at Aylesford	Maidstone Council	100 guineas	No date.

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c., supplied by	Tenders to be delivered
*Isolation Hospital Buildings	Acton District Council	Council's Surveyor, 242, High-street, Acton, W.	Aug. 18
Surveyor's Materials	Portsmouth Corporation	A. Hellard, Town Hall, Portsmouth	do.
Broken Granite, &c., Barnet	South Mims R.D.C.	G. D. Byfield, 16, High-street, Barnet	do.
Lodge, &c., Woodbridge Hospital, Guildford	The Guardians	E. L. Lunn, Architect, High-street, Guildford	do.
Electricity Buildings, North Shields	Tynemouth Corporation	J. F. Smillie, County Surveyor, Tynemouth	do.
Sewers, &c., Kingston-road	Leatherhead U.D.C.	T. Salkield, Surveyor, Council Offices, Leatherhead	do.
Cart Shed, &c., Miller Park	Preston Corporation	Borough Surveyor, Town Hall, Preston	do.
Bridge Works, Scotland-road	Nelson (Lancs) Corporation	B. Ball, Civil Engineer, Town Hall, Nelson	do.
Shop and Stores, Harnall-lane East	Coventry Co-operative Soc., Ltd.	Harrison & Hattrell, Architects, 23, Hertford-street, Coventry	do.
Six Houses, King Edward's-road, Coventry	do.	do.	do.
Additions to Infirmary	.....	E. Seward, Architect, Cardiff	do.
Lock-up Shops, Cleator Moor, near Huddersfield	.....	J. Berry, Architect, Market-place, Huddersfield	Aug. 19
Organ Chamber, &c., at Parish Church, Llandilofawr	.....	D. Jenkins, Architect, Llandilo	do.
Caretaker's House at Schools	Hemsworth School Board	W. E. Richardson, Architect, Rothwell, Leeds	do.
Cottages, Easter Coltfield, near Elgin, N.B.	.....	Reid & Wittel, Architects, Elgin	do.
Walling round Pier	Gillingham (Kent) U.D.C.	F. C. Boucher, Council Offices, New Brompton	do.
Additions to Schoolroom, Cowbridge-road, Cardiff	.....	Rev. D. T. Evans, 5, Eton-place, Cardiff	do.
Steel Girders (35 tons) Holbeck	Leeds Corporation	City Engineer, Municipal Offices, Leeds	do.
Portland Cement (5,000 tons)	Blackpool Corporation	J. S. Brodie, Borough Engineer, Town Hall, Blackpool	do.
Additions to Schools, Park-road	Barnsley School Board	E. W. Dyson, Architect, 14, Market-hill, Dewsbury	do.
Steel Works, New Bridge-street	Barnsley Town Council	J. H. Taylor, Civil Engineer, Manor House, Barnsley	do.
Wall, &c.	Gillingham U.D.C.	F. S. Boucher, Council Offices, New Brompton	do.
House, Caeran (Wales)	Ms. North's Navigation Collieries Co.	E. W. Burnett & Son, Architects, Tondu	do.
Shelter, &c., in Park	Cleethorpes U.D.C.	E. Rushton, Surveyor, Poplar-road, Cleethorpes	do.
Ten Houses, Whitehall, Woolmer Forest, Hants	Mr. W. White	Rake & Cogswell, Architects, Prudential Buildings, Portsmouth	do.
Road Works at Cemetery, Hulme Hall-road	Manchester Corporation	City Architect, Town Hall, Manchester	do.
Stabling, Black Horse Hotel, Otley	Messrs. W. Whitaker & Co.	H. Chippindale, Architect, Guiseley, near Leeds	do.
Cottages, Kilnaglery, Ireland	Kinsale R.D.C.	J. Murphy, Board Room, Kinsale	do.
Additions to Church, Marsden (Yorks)	.....	J. E. Lunn, Architect, Milnsbridge	Aug. 21
Six Houses, Hough-lane, Wombwell	Mrs. E. Bashford	J. E. Swindlehurst, Civil Engineer, Coventry	do.
Fifty Workmen's Dwellings, Public Offices, &c.	Risca (Mon.) U.D.C.	do.	do.
Drainage Works at Harbour Offices	Swansea Harbour Trustees	J. L. Smith & Davies, Architects, Aberdare	do.
*Isolation Hospital	Upton-on-Severn (Worcs.) R.D.C.	Borough Engineer, Town Hall, Barrow	Aug. 22
Additions to Manager's House, Shelley, nr. Huddersfield	Gaslight Co., Ltd.	D. L. Jones, Architect, 12, West End, Llanelly	do.
*Painting Works at the Infirmary, &c.	Wandsworth and Clapham Union	J. H. Lewis, Civil Engineer, Pengam, via Cardiff	do.
Three Shops, Market-street, Milnsbridge, Yorks	.....	C. Cole, Town Hall, Earlestown, Lancs.	do.
Stoneware Pipes, &c.	Coventry Corporation	J. Gibson, Engineer, Leigh, Lancs.	do.
Cast Iron Pipes	do.	E. B. B. Newton, Town Hall, Paddington	do.
Rebuilding St. Mark's Church, Rhymney	The Vicar and Churchwardens	T. Wrim & Sons, Architects, 92, Albion-street, Leeds	Aug. 24
Alterations to Municipal Buildings	Barrow-in-Furness Corporation	Selfer Smith, Architect, Builth Wells	do.
Additions to Chapel, Lloyd-street, Llanelly	.....	T. Watson, Surveyor, Kirkeswald	do.
Broken Limestone, Tredegar (Mon.)	Bedwellty U.D.C.	T. W. Hayward, Civil Engineer, 8, St. Mary's-street, Stamford	do.
Reservior	Newton-le-Willows U.D.C.	W. A. Vignoles, Architect, Grimsby	do.
Laying Water Main	Leigh (Lancs) Town Council	R. R. Owen, Council Offices, Llanwrst	do.
*Construction of Room at Public Baths	Paddington Council	F. Bedman, Engineer, 34, Wood-street, Swindon	do.
Rebuilding Offices, Albion-street, Leeds	.....	C. S. Errington, Architect, Grainger-street, W. Newcastle	do.
Church Works, St. Mary's Church, Builth Wells, Brecon	.....	R. B. Pratt, Architect, Elgin	do.
Stone Wall, Little Saikeld	Penrith R.D.C.	N. A. Smith, County Surveyor, 41, Parliament-street, S.W.	do.
Road Works, Northfields Estate	Stamford Corporation	Morham & Gardner, 29, Hanover-street, Edinburgh	do.
Underground Station at Electry. Works, Doughty-rd.	Grimsby Corporation	A. Marshall, Architect, King-street, Nottingham	do.
Water-mains, &c.	Llanrwst (Wales) R.D.C.	W. S. Williams, Architect, Tredegar	do.
Water Supply Works, near Swindon	Highworth R.D.C.	MacWhannell & Rogerson, Architects, West Regent-street, Glasgow	Aug. 25
Schools Forsyth-road, West Jesmond	Newcastle-on-Tyne School Board	Borough Engineer, Town Hall, Portsmouth	do.
Rebuilding Business Premises, Elgin	Mr. W. Ramsay	Beesley, Son, & Nichols, Civil Engineers, 11, Victoria-street, S.W.	do.
Widening Aldenham-road, Bushey	Hertfordshire County Council	R. W. Cass, Surveyor, Council Offices, Farnham	do.
*Erection of Carnegie Free Library	Montrose Town Council	W. F. Bird, Civil Engineers, Midsomer Norton, near Bath	do.
*Infirmary Extensions	Newark Union	H.M. Office of Works, Storey's Gate, S.W.	do.
*Erection of Seventy Houses, near The Rhyd, Tredegar	United Building Society	do.	do.
Workhouse Buildings, Crookstown, Renfrewshire	.....	H. Quick, Architect, 64, Hertford-street, Coventry	Aug. 26
Sewers, &c., Copnor-road	Portsmouth Corporation	T. Houston, Architect, Wellington-place, Belfast	do.
Sewage Disposal Works	Worcester Corporation	G. H. Pickles, Civil Engineer, Town Hall, Burnley	do.
Granite Road Metal	Farnham U.D.C.	E. T. Hall, Architect, 54, Bedford-square, W.C.	Aug. 27
Water Supply Works	Clutton R.D.C.	W. C. Williams, Architect, 29, Southgate, Halifax	Aug. 29
*New Branch Post Office, Barry Dock	Commissioners of H.M. Works, &c.	Stevenson & Burstal, Engineers, 38, Parliament-street, S.W.	Aug. 31
*Enlargement Head Post Office, Birmingham	do.	Clerk to the Asylum, Board Room, Ennis, D.L.A.	do.
Infirmary and Laundry	Nuneaton Guardians	Council's Surveyor, Market-place, Kettering	do.
Additions to Church, Armagh-road, Portadown, Ireland	The Presbyterians	W. Hope, Architect, Seymour-road, Hampton Wick	do.
Sewage Tanks	Burnley Corporation	J. E. Hargreaves, Surveyor, Town Hall, Farnborough	do.
*New Drainage, Paving Yards, &c., at Workhouse	St. George's Union	R. G. Nicol, Engineer, Aberdeen	Sep. 2
Additions to Workhouse, Gibbet-street	Halifax Guardians	E. A. Everett, Council Offices, Thames Ditton	Sep. 3
Cast Iron Pipes, &c.	Devonport Corporation	Council's Surveyor, Town Hall, Spa-road, S.E.	Sep. 4
*Water Tower Pump House, &c.	Ennis Dis. Lunatic Asylum Commit	Director of Works Department, 21, Northumberland-avenue, W.C.	do.
Private Street Works	Kettering U.D.C.	H.M. Office of Works, Storey's Gate, S.W.	Sep. 8
Public Offices, &c., New Malden	Maldens and Coombe U.D.C.	Council's Surveyor, Town Hall, Spa-road, S.E.	Sep. 14
Road Materials, &c.	Farnborough U.D.C.	J. Rees, Architect, Hillside Cottage, Pentre	do.
Widening Poera Quay	Aberdeen Harbour Commissioners	Clerk to the Council, District Council Offices, Pontypridd	do.
Sewers, &c., Thames Ditton	Esher U.D.C.	J. Brown, Architect, 12, Castle-street, Shrewsbury	Sep. 16
Offices, &c. at Town Hall	Bermondsey Borough Council	J. Mansergh & Sons, 5, Victoria-street, S.W.	Oct. 6
*New Coastguard Buildings, near Sandown (I. of W.)	The Admiralty	Engineer's Department, County Hall, Spring Gardens, S.W.	No date.
*Mercantile Marine Office at Barry Docks	Commissioners of H.M. Works, &c.	Rev. T. W. Willis, Lanercost Vicarage, Brampton	do.
*Extensions to Dust Destructor House, &c.	Bermondsey Borough Council	Goodey & Cresswell, Architects, Colchester	do.
Schools, Penygraig, Wales	Ystradyfodwg School Board		
*New Public Offices, Morgan-street, Pontypridd	U.D.C. of Pontypridd		
Market House, Assembly Hall, &c.	Wem (Salop) U.D.C.		
*New Engine and Boiler Houses at Monument-lane	Birmingham Corporation		
*New Bridge over Thames at Vauxhall	London County Council		
House, Lees Hill School, Brampton, Cumberland	The Managers		
Church, &c., Wimpole Estate, Colchester	.....		

[See also next page

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in
*Architectural Draughtsman	Aldershot U.D.C.	2*l.* 10s. per week	Aug. 20
*Teacher of Building Trade Subjects	Limerick Technical Education Com.	130*l.* per annum	Aug. 24
*Teacher of Plumbing	do.	100*l.* per annum	do.
*Evening Teacher (Technl. Drawing & Bldng. Cnstrn.)	Middlesex Education Committee	Not stated	Aug. 29
*Borough Engineer and Surveyor	Croydon Borough Council	800*l.*	Sep. 1
*Assistant Sanitary Inspector	Willesden U.D.C.	100*l.*	Sep. 8
*District Surveyor, South Fulham	London County Council	See Advertisement	Sep. 14

Those marked with an asterisk (*) are advertised in this Number. *Competitions*, iv. *Contracts*, iv. vi. viii. x. *Public Appointments*, xvi.

TO CORRESPONDENTS.

W. J. (Below our limit). "Spakesham" (You did not enclose your address with your inquiry). E. & C.—J. R. C.—R. C. & Son (Amounts should have been stated).

NOTE.—The responsibility of signed articles, letters, and papers read at meetings rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

All communications must be authenticated by the name and address of the sender, whether for publication or not. No notice can be taken of anonymous communications.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article is given subject to the approval of the article, when written, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than 10 a.m. on Thursdays.* N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under 100*l.*, unless in some exceptional cases and for special reasons.]

* Denotes *accepted*. † Denotes *provisionally accepted*.

BLACKHILL (Durham).—For the erection of road works for the Benfieldside Urban District Council. Mr. Thos. Knox, surveyor, 40, Thomas-street, Blackhill:—

T. J. Turnball	£123 10 2	G. J. Christopher, Blackhill*	£114 16 6

CARDIFF.—For the construction of an underground convenience, North-road, for the Corporation. Mr. W. Harpur, C.E., Town Hall, Cardiff. Quantities by Engineer:—

F. Bond	£3,450 0 0	W. T. Symonds	£3,276 4 5
Knox & Wells	3,344 18 1	Turner & Sons	3,247 16 1
D. W. Davies	3,340 0 0	Allan & Son*	3,089 0 8

[All of Cardiff.]

CARDIFF.—For the erection of a lodge at sanatorium, Canton, for the Corporation. Mr. W. Harpur, C.E., Town Hall, Cardiff. Quantities by engineer:—

G. Burgess	£363 15 1	Blacker Bros.	£488 0 0
Symonds & Co.	501 13 8	Knox & Wells	424 3 0
W. T. Morgan	490 0 0	F. Bond*	410 0 0

[All of Cardiff.]

DEWSBURY.—For additions to mills, Savile Town, for the Cut End Mill Co. Messrs. C. H. Marriott, Son, & Shaw, architects, Church-street-chambers, Dewsbury:—

Masonry.—Hiram Hirst, Dewsbury*	£182 9 0
Joinery.—H. Ingham, Thornhill Cross, near Dewsbury*	184 8 7
Ironfounder.—F. Firth, Dewsbury*	180 0 0
Slating.—Brear & Son, Dewsbury*	40 0 0
Plumbing.—Knowles & Hemmingway, Dewsbury*	35 15 0

EXMOUTH.—For the erection of schoolroom and classrooms at Southlands School, Fairfield, Exmouth, for the Misses Vinter. Mr. Walter B. Coles, architect, 31, Bath-road, Exeter. Quantities by Mr. Vincent Cattermole Brown, Paignton:—

A. Hayman	£729 16 6	W. Perry	£670 0 0
Crews & Son	702 0 0	F. Grace	642 6 7
T. Abell	687 1 0	Cooper & Son*	593 5 6

[All of Exmouth.]

HATCHAM.—For alterations to printing works, Hatcham, S.E. Mr. Delmé G. Mootham, architect, Effingham House, Arundel-street, Strand, W.C.:—

Asphalting.—Salter & Co.	£79 19 6
Granite Paving.—William Downs	228 18 0
Dilapidations.—William Downs	82 0 0
Iron Fencing.—Tower, Tower, & Co.	19 10 0
Wood-Block Flooring.—Andrews & Co.	165 12 6
Iron Doors.—Lift and Hoist Co.	33 0 0
Electrical Work.—Marcyod & Place	112 16 0

LEAMINGTON.—For the supply of 4,500 tons road-stone, for the Corporation:—

	Per ton.
Clee Hill Dhu Stone Co.	11 7
Judkins, Tuttle Hill Quarries	8 6

LICHFIELD (Staffs.).—For additions to workhouse, for the Guardians. Mr. D. C. Marks, architect, St. Mary's Chambers, Lichfield:—

Wood & Son	£964 12 0	W. Hopkins	£795 0 0
Smith & Sons	881 4 4	Lowe & Sons, Burton-on-Trent*	785 0 0
A. Walmesley	843 0 0		
W. H. James	810 0 0		

LLANRIEG.—For new dwelling-houses at Llanrieg, for Mr. W. G. Roberts, Carnarvon. Mr. Rowland Lloyd Jones, architect, 14, Market-street, Carnarvon:—

	Seven Houses.	Three Houses.	Repairs to four old Houses.
	£	£	£
W. & R. Jones	1,052	—	—
Jones Bros.	1,600	—	834
W. D. Williams	1,500	—	—
W. Roberts & R. E. Jones	1,399	—	784
W. & O. Pritchard	—	670	760
Roberts & Williams	—	618	740
H. Jones	1,281	—	—
W. J. Griffith, Carmel, Groeslon, R.S.O.	1,250	—	*660

MAELTRYFAN.—For new Independent chapel at Maeltryfan, near Carmel. Mr. R. Lloyd Jones, architect, 14, Market-street, Carnarvon:—

	Chapel and Schoolroom.	Chapel only.
Jones Bros.	£1,765	£1,327
W. J. Griffith	1,750	1,320
W. Owen & S. Roberts	1,511	1,177
W. & R. Jones	1,510	1,160
Jones & Son, Rhostryfan	1,450	*1,150

MERTHYR (Wales).—For the construction of a river wall, Troedyrhiw sewage farm, for the Committee. Mr. T. F. Harvey, Engineer, Town Hall, Merthyr:—

J. Sutherland, Abercynon*	£576

NETHER EDGE (Sheffield).—For sundry additions and alterations to Guzerat House, Nether Edge-road and Glen-road, for Mr. E. Wells Smith. Messrs. Hall & Fenton, architects and surveyors, 14, St. James-row, Sheffield. Quantities by architects:—

A. Andrews	£500 5	Powell & Sons	£389 0
Maston & Son	475 10	Wilkinson & Sons	359 0
E. & W. Oxley	409 0	T. Margerrison, Church-street, Dronfield*	355 0
H. White	403 10		
J. S. Teanby	398 5		

OADBY (Leicestershire).—For the construction of sewers, &c., for Blaby R.D.C. Mr. J. Turner, Surveyor, Glen Parva, near Leicester:—

A. Jewell	£3,245	King & Riley	£2,275
A. Barry	2,875	Stimson & Rolleston	1,809
Hutchinson & Son	2,553	J. Holmes, Leicester*	1,683
C. Chamberlain	2,550	H. Mason	1,668
G. Philbrick	2,521	W. Mattock	1,635

OLD LENTON (Nottingham).—For erection of new ropery works, situate in Spring-close, Old Lenton, for Messrs. W. Coates & Sons. Mr. Fred. C. Martin, architect, Angel-row, Nottingham:—

Dennett & Ingle	£4,150	T. H. Harper	£3,900
Maule & Co.	4,030	J. H. Vickers, Ltd.	3,885
F. Messom	4,000	Williamson & Co., Nottingham*	3,870
J. Wright	3,968		

PAIGNTON.—For the erection of proposed cottage flats, Merritt-road, Paignton, for Mr. W. M. G. Singer, C.C. Mr. W. G. Couldrey, architect, Paignton. Quantities by Mr. Vincent Cattermole Brown, Paignton:—

E. Westlake	£5,116 0	C. & R. E. Drew	£4,992 15
G. Webber	5,096 10	Webber & Sons‡	4,916 0
Harris & Sons	5,035 0		

[All of Paignton.]

‡ Accepted subject to modifications.

PONTLOTTYN (South Wales).—For alterations and additions to business premises, The Square, Pontlottyn, for Messrs. H. Woodley & Co., Cardiff. Mr. D. Pugh-Jones, architect, Queen's-chambers, Cardiff:—

Courens & Co., Riverside Works, Cardiff*	£715

REIGATE.—For additions to electric lighting station, Wray Common-road, for the Town Council. Mr. F. T. Clayton, C.E., Municipal Buildings, Reigate. Quantities by engineer:—

Elsey & Sons	£2,225 14 10	Nightingale & Sons	2,023 0 0
Saunders Jeal	2,220 0 0		

[All of Reigate.]

ST. ALBANS.—New warehouse for Messrs. Ryder & Son. Mr. Percival C. Blow, architect, 7, London-road, St. Albans:—

Miskin & Son	£3,545 0	W. Sharp, St. Albans*	£3,104 0
E. Dunham	3,491 0		
J. Bushell	3,445 15		

ST. ALBANS.—Rebuilding warehouse for Messrs. Cooper, Box, & Co., Ltd. Mr. Percival C. Blow, architect, 7, London-road, St. Albans:—

Boff Bros.	£2,075	Warton & Dunstall, Bedford†	£1,930
E. Dunham	1,978		
Miskin & Son	1,974		

ST. ALBANS.—Enlargement for Messrs. Watson & Co. Mr. Percival C. Blow, architect, 7, London-road, St. Albans:—

J. Bushell	£349 15	W. Sharp, St. Albans*	£330 0

ST. NEOTS.—For additions to infirmary. Union Workhouse, St. Neots, Hunts. Mr. S. Inskip Ladds, architect, Huntingdon. Quantities by Messrs. A. Boxall & Son, 8, Adam-street, Adelphi, W.C.:—

Kerridge & Shaw	£2,953 15	W. Howard	£2,259 0
F. Giddings	2,642 0	W. Wade	2,165 0
Willmott & Sons	2,626 0	Wrycroft & Sons, St. Neots†	2,135 10
Page & Son	2,333 0		
F. Wellham	2,310 0		

SEABROOK (Kent).—For the erection of a police-station and hall, for the Kent County Council. Mr. F. W. Ruck, County Surveyor, 86, Week-street, Maidstone:—

Trethowan & Brest	£1,750 0 0
F. W. & J. Clark	1,595 10 0
B. E. Nightingale	1,360 0 0
J. Gosby	1,347 13 1
Goodwin & Jeffery	1,332 0 0
Castle & Son	1,300 14 3
Pearce & Sons	1,240 0 0
A. Dyke	1,238 15 0
R. Avard	1,238 0 0
W. W. Martin	1,222 0 0
Howland & Son	1,212 4 10
Wallis & Sons	1,167 0 0
Smith & Son	1,099 0 0

STOCKPORT.—For the erection of sewering, Athens-street, for the Corporation. Mr. John Atkinson, C.E., St. Petersgate, Stockport:—

R. H. Rogers	£278 9 2	P. D. Hayes, Old-road*	£168 7 0
W. H. Ena	179 15 10		

STOKE-ON-TRENT.—For the erection of an isolation hospital, for the Cheadle Rural District Council. Mr. F. T. Inskip, Surveyor, Brook House, Cheadle:—

		Water Supply.
Bridgett & Hand	£1,851	£130
W. Alcock, Cheadle, Staffs*	1,755	112
J. Bagnall	1,066	220
J. Pattison	1,140	132
Surveyor's estimate	1,000	120

TUNBRIDGE WELLS.—For paving, &c., Newton-road, for the Town Council. Mr. W. H. Maxwell, C.E., Town Hall, Tunbridge Wells:—

A. C. Soan	£827 17 6
Windsor & Co.	754 16 9
Crates & Son	720 0 0
T. Hallett	692 9 5
Free & Sons	690 13 4
T. G. Challans	659 5 6
Ellis & Co.	600 1 0
Arnold & Sons	570 8 4
J. Jarvis, Tunbridge Wells*	568 4 10

WAKEFIELD.—For alterations at sewage works, Agbrigg, for the Sandal Magna Urban District Council. Mr. F. Massie, Surveyor, Tetley House, Wakefield:—

Flower Bros.	£431 0 6	T. & G. Wilson	£247 7 6
Egan & Sons	394 6 2	John Armitage, Cutwood*	232 10 0
Higgins & Pashley	339 1 6		

WALSALL.—For additions to workhouse, Pleck-road, for the Guardians. Mr. H. E. Lavender, architect, Bridge-street, Walsall. Quantities by architect:—

Linsday Jones	£9,255	Kendrick & Son	£8,310
Dallow & Son	8,750	G. H. Marshall	8,261
W. Wistance	8,739	T. Tildesley	8,249
T. Hardy	8,580	Willcock & Co.	8,120
J. Mallin	8,579	W. Hopkins	7,990
D. Roberts	8,550	Harvey Gibbs, Kings Heath*	7,979
T. Hughes	8,410	R. Harris	7,930
Guest & Son	8,400		

[*See also next page.*

LONDON SCHOOL BOARD TENDERS.

At the last meeting of the London School Board the Works Committee submitted the following lists of tenders. Mr. T. J. Bailey is the Board's Architect :—

DUNCOMBE-ROAD SCHOOL.—Exterior painting :—

McCormick & Sons	£222	Chinchen & Co.	£193
Bate Bros.	220	G. Kirby	187
Grover & Son	196	F. W. Harris	179
C. & W. Hunnings	196	Stevens Bros.	174
Wall & Co.	195	Marchant & Hirst*	167

HEBER-ROAD SCHOOL.—Exterior painting :—

F. & H. F. Higgs	£270	J. F. Ford	£169
Mitchell & Son	264	G. Kemp	158
J. & C. Bowyer	217	Maxwell Bros.*	149

HONEYWELL-ROAD SCHOOL.—Exterior painting :—

J. & M. Patrick	£364 0	W. Hornett	£220 0
Dowsett & Jenkins	261 0	E. B. Tucker	225 0
General Builders, Ltd.	247 0	Rice & Son	203 0
Johnson & Co., Ltd.	235 0	E. Flood*	152 10

KNAPP-ROAD SCHOOL.—Exterior painting :—

Gibb & Co.	£180 0	A. W. Derby	£110 0
J. F. Holliday	159 0	G. Barker	104 10
A. J. Sheffield	144 0	Haydon & Sons*	101 0
Vigor & Co.	112 0		

MANTUA-STREET SCHOOL.—Exterior painting :—

Macey & Sons, Ltd.	£159 0	E. Triggs	£139 0
Holloway Bros., London, Ltd.	148 10	R. S. Ronald	135 0
R. A. Jewell	140 0	Rice & Son*	133 0

MIDWAY-PLACE SCHOOL.—Exterior painting :—

J. & M. Patrick	£227 0	Johnson & Co.	£158 0
Lathey Bros.	168 0	H. Groves*	139 0
Sayer & Son	168 10		

NUNHEAD-PASSAGE SCHOOL.—Exterior painting :—

J. F. Ford	£208	W. Hooper	£155
W. V. Good	186	Sayer & Son	153
F. & H. F. Higgs	160	Garrett & Son*	152
Maxwell Bros., Ltd.	155		

OLD WOOLWICH-ROAD SCHOOL.—Exterior painting :—

Hayter & Son	£175 0	H. Groves	£144 0
C. G. Jones	150 5	Lathey Bros.	137 0
W. Banks	145 10	Proctor & Son*	112 0

RATHFERN-ROAD SCHOOL.—Exterior painting :—

Hayter & Son	£225 0	C. G. Jones	£169 10
F. & H. F. Higgs	215 0	W. Banks	160 0
M. E. Allen	209 7	G. Kemp	127 0
J. & C. Bowyer	196 0	H. Groves*	122 0

RUSHMORE-ROAD SCHOOL.—Exterior painting :—

G. Wales	£251 0	Shurmur & Sons, Ltd.	£160 0
J. Stewart	226 0	F. Bull	149 14
Barrett & Power	170 0	Silk & Son	142 10
Corfield & Co.	166 6	Woolaston Bros.	135 0
H. Runham Brown	163 0	A. Porter*	126 0

SCRUTTON-STREET SCHOOL.—Exterior painting :—

G. Wales	£207 0	Wilmott & Son	£149 0
Barrett & Power	181 0	H. Runham Brown	143 10
Corfield & Co.	169 14	W. Chappell	135 0
Silk & Son	156 0	Haydon & Sons*	134 10

SETTLES-STREET SCHOOL.—Exterior painting :—

J. F. Holliday	£279 10 0	Gavin Bros.	£199 5 0
Johnson & Co.	272 0 0	J. Haydon & Sons	196 0 0
D. Gibb & Co.	225 0 0	G. Barker*	179 0 0
Vigor & Co.	215 12 6		

WENLOCK ROAD SCHOOL.—Exterior painting :—

Belcher & Co., Ltd.	£301 0 0	Gavin Bros.	£233 16 3
Grover & Son	298 0 0	Lathey Bros.	231 0 0
McCormick & Sons	288 0 0	Johnson & Co.	216 0 0
		Haydon & Sons*	195 0 0

WOOLMORE-STREET SCHOOL.—Exterior painting :—

J. F. Holliday	£179 0 0	Vigor & Co.	£130 0 0
D. Gibb & Co.	175 0 0	A. W. Derby*	110 0 0
A. J. Sheffield	167 0 0		

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